

JOINT ARMY-NAVY TASK FORCE NUMBER ONE

OPERATION CROSSROADS -- RELEASE NO. 46

FOR RELEASE WITH PICTURES
TO PRESS AND RADIO AT
VICE ADMIRAL BLANDY'S PRESS CONFERENCE
2:30 P.M. (E.S.T.), MAY 13, 1946

FULL STORY OF ATOMIC BOMB TESTS
WILL BE TOLD TO PUBLIC

Vice Admiral W. H. P. Blandy, U.S.N., Commander Joint Army-Navy Task Force One, announced today that observers and representatives of the press would be able to view the general arrangement of the target vessels and other military equipment in Bikini Atoll. While technical details will not be disclosed, the press will see the target array, both before and after the tests, and both from the surface and from the air.

This is but one step being taken to insure that the public has fullest confidence that the experiments are being conducted purely as fact-finding scientific tests for future guidance with no intent to "prove" or "disprove" any present-day theories concerning military, air and naval strategy and tactics. All possible facts consistent with National security will be released so that the public will not await the results with the misconception that these tests alone will once and forever establish whether there will be a great or small air force, navy or ground force.

Early in the planning stages of the tests it was clearly recognized that no one test or series of tests could at the same time:

- (a) Simulate war conditions,
- (b) Provide the data which are desired from the purely scientific point of view, and
- (c) Provide the data which are essential if military and naval strategists, engineers, designers and medical officers are to have the information they need in order to proceed along sound and economical lines in developing our Armed Forces.

The basic directives require that the tests provide the essential data required by the Armed Forces. The tests are primarily planned, therefore, to determine and to measure with precision what happens at various distances when an atomic bomb is used against ships and other items of military equipment such as tanks, airplanes, radio sets, etc. Much information of value to pure science will also be obtained, and, where practicable, duplication or simulation is made of typical operating conditions.

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The arrangement of the ships in the target array for the first test was reached after the many factors affecting the problem were carefully analyzed by the Army and Navy and by civilian scientists. The array agreed upon is considered the best which will obtain the maximum of valuable information.

It is so arranged that (a) maximum damage will be inflicted on the cluster of ships at the point of aim by one airplane dropping one bomb, and (b) a progressive decrease in damage will be inflicted on ships at increasing distances from the explosion to a point where it is intended that almost negligible damage will be encountered by ships farthest from the aiming point.

Some of the ships and target material, at considerable distances from the point of aim in the first test, can probably be placed in satisfactory condition to be close to the point of detonation in the second test. This aspect was considered in the arrangement of the target array.

Some of the smaller ships have little significance from the point of view of measuring effects of blast on the ships themselves but are stationed at measured distances in order to form platforms on which recording instruments and cameras may be installed.

Typical conditions will be approximated by loading the ships with varying degrees of combat supplies such as fuel oil, gasoline, bombs, ammunition, torpedoes, etc. The ship loadings will vary from some almost full to some almost empty, which is the normal situation with ships at sea and at anchor both in war and peace.

However, there is no thought of simulating an "attack" by atom-bomb-loaded airplanes against a disposition of ships at sea or at anchor in a harbor. This should be very clear from the diagram of the approximate target array to be used in the first test which is furnished herewith. This diagram shows relative locations of ships, and closely approximates the expected exact location of each ship. It should be remembered, however, that the final locations of the ships at the time of the tests will depend on such factors as the direction of the wind and the length of anchor chain, as ships riding to a single anchor will swing to the wind in a circle a quarter mile or more in diameter.

Also furnished is a diagram showing a portion of a carrier task force at sea and a typical anchorage plan, drawn to exactly the same scale and compared to the target array diagram for the Bikini Atoll test.

Simulation of actual bombing attack conditions is also precluded by the fact that only one bomb is used and by several other factors. More than a score of ships are concentrated within a circle of 1,000 yards radius at the center of the Bikini array for two principal reasons:

First, to insure doing major damage to a capital ship even if the bomb does not detonate exactly over the bullseye, and, second, to provide a positively identifiable point of aim to the bombardier from a high bombing altitude. Other steps being taken to place the bomb over the aiming point with the extreme accuracy required in this test and not normally available or essential under war conditions include: Painting the battleship NEVADA at the center a bright red-orange, installing a radar beacon on the NEVADA, providing special destroyer station ships as navigation checks for the bomber's approach, and using precise radar methods for obtaining accurate wind data at all altitudes over the target.

The bomb which will be used in both of the tests in 1946 is the "standard" type. This is the type which was used at Nagasaki. It is the best type which we have available and that is the reason it is being used. There is no desire on the part of the Joint Chiefs of Staff or the personnel conducting the CROSSROADS Operation to "hold back" a more powerful bomb. If a more powerful bomb were now available, it would be employed.

For reasons of security, the President has decreed that all information connected with the development, manufacture, operational techniques and characteristics of the atomic bomb be kept a secret of the United States. For related security reasons the information outlined below cannot be made public:

- (a) The exact point of detonation of the bomb with respect to the point of aim of the target array.
- (b) The altitude at which the bomb is detonated.
- (c) The exact bearings and distances at which the ships are stationed with respect to each other.
- (d) The special equipment and techniques used by the airplane involved in dropping this bomb.
- (e) The exact pressures, temperatures and other data obtained at various distances from the point of burst.
- (f) The degree of efficiency of the explosion.

(It is conceivable that the bomb might be almost a "dud" or have a very "efficient" high-order detonation. With our present limited knowledge of atomic fission, there is a range of possibilities between these two extremes which cannot be accurately foretold or measured. Whether or not determined, no official announcement is contemplated as to the factor of efficiency of explosion obtained.)

- (g) Large numbers of detailed photographs showing bomb damage.

(Photographs produce exact and measurable records; analysis of large numbers of related photographs of bomb damage can evolve much precise information. While the press representatives who write for publication and broadcast by radio will be permitted to do so without censorship of their copy, the national security requires that all photographs be reviewed for security and that the information obtainable from photographs of damage be limited. Representative pictures showing damage will be released as soon as practicable after the tests, some by radio photo from Bikini. These pictures will be selected to provide the public with a true graphic record of the general effects of the test. Only such identification of ships and viewpoints in the photographs will be released as will not prejudice the security interests of our country.)

The evaluation of the information obtained from the Bikini tests will take many months. Intelligent progress toward world peace as an enduring condition on our planet may be jeopardized if the public of the world at large, as a result of the headlines made by the tests, jumps to hasty and possibly erroneous conclusions as to the effects of atomic attacks against ships and military material. No sound conclusions can be reached prior to a studied evaluation of the results of the tests by the Joint Chiefs of Staff. To assist them in this evaluation the Joint Chiefs of Staff have appointed a Board of civilian, military, and naval experts who have also been available to Commander Joint Army-Navy Task Force One for advice during the major part of the planning and execution of Operation CROSSROADS.

FOR IMMEDIATE RELEASE
2:00 P.M., PST, MONDAY,
4 FEBRUARY 1946.

STATEMENT OF RECOMMENDATIONS ON RELEASE OF ATOM BOMB PROJECT
INFORMATION

NO SINGLE "SECRET"

A great deal has been said during the past six months about the "secret" of the atomic bomb and what should be done with it. It has, during this time, gradually become apparent that there really is no single "secret" of the atomic bomb but rather that innumerable pieces of scientific and technical information have been incorporated in its production.

NEW DISCOVERIES MADE

However, it has not been as fully appreciated perhaps that a great mass of scientific and technical information has been accumulated during the course of the research and developmental work on the bomb and that this is of enormous potential value to the peacetime science and industry of the country--not only in the field of nuclear science but in many other fields--if it can be made available. At the present time it is locked up in the files of the various academic and industrial organizations that did the actual work, and nobody is permitted to make any use of it except for the manufacture of atomic bombs. The Army wishes to modify the existing secrecy restrictions which were necessitated by the War, and desires to make useful scientific and technical information generally available, where this can be done without endangering our national security.

COMMITTEE APPOINTED BY GROVES

About three months ago, Major General L. R. Groves asked the scientists whose names appear below to act as a committee to formulate recommendations for a program on the release of scientific and technical information obtained as a result of the development of the atomic bomb. We have given careful consideration to this important and complex problem and have arrived at certain conclusions; these may be of public interest since many widely divergent views have previously been expressed on this matter.

GENERAL VIEWS OF COMMITTEE

The directive which this committee was requested to fulfill is to make recommendations as to the release of information in the interest of national welfare and of national security. In considering the problem we have not intended to minimize the supreme

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importance of the establishment of international controls, nor are we unaware of the fact that such controls, once established, would profoundly alter the requirements of national security. We have, however, thought that it would be useful to make all possible progress in releasing valuable scientific and technical information even at the present time when the elaboration of international controls is in its earliest stages. Our fundamental belief is that the release of basic scientific and technical information obtained during the development of the bomb would, over a sufficiently long term, not only enhance our national welfare but actually conduce to our national safety; however, we recognize that those charged with the security of the country may be led to the conclusion that the time is inopportune for the release of certain information of a special nature. Even so we believe that nearly everyone will agree that there is much that can be disclosed at the present time without danger to our military security. We are convinced that practicable and sound principles can be formulated which will make it appropriate to release such information at once provided the release is carried out with circumspection and discernment under competent and informed guidance. The needless withholding of new developments is bound to delay progress in technical fields, and hence to have serious consequences for our national welfare and security, while the disclosure of a great store of new and useful information will stimulate the growth and development of science and industry. It is to this end that we have primarily directed our recommendations.

SPECIFIC RECOMMENDATIONS OF COMMITTEE

We have made recommendations to General Groves as to specific topics on which information should be released at once; most of these are of a broad scientific or general technical nature. We believe that there would be agreement that information on these subjects could be released promptly without danger to our military security. The release of such information should proceed as rapidly as feasible in order to promote a return to those conditions of free intellectual interchange under which scientific education can be carried on with dignity and success. Only under these conditions of unimpeded growth can science have its most healthy and flourishing development. There are other important topics mostly of a critical scientific nature on which we are convinced that an early release of information would be desirable, but release of which at this time is likely to be controversial. Hence we have not recommended that action on information of this type should be taken now. Finally there are topics which are for the most part of a military nature in the broadest sense--for example the design and availability of atomic weapons. On these we believe that release of information must be made a matter of general national policy to be determined by the Congress and the President.

SMYTH REPORT FIRST STEP

We regard the release of the Smyth Report by the Manhattan District last August as the first step in the establishment of a desirable and rational policy for the release of information and we wish to express our approval of its publication. Although the report was written before the principles outlined above had been formulated by this Committee it was nevertheless prepared in accordance with a carefully thought-out and conservative set of rules, devised for the purpose of presenting a general picture of the development of the atomic bomb rather than for the purpose of releasing useful scientific and technical information. Indeed there was very little scientific information given in the Smyth Report beyond that which had already been reported in the scientific literature. We believe that the time has now come for the War Department to take the next step and release additional information in order to foster the development of a strong and healthy science and of a vigorous and inventive industry.

ADDITIONAL ACTION

We have made recommendations to General Groves not only as to topics on which information should be released, but also as to administrative machinery which will assure a close control of the release in such a way as to prevent inappropriate disclosures. It is our clear conviction that the release of information in accordance with the policies outlined would be for the best interests of the country. We have been informed that the Manhattan District has recently taken steps toward implementing the recommendations we have made to General Groves. We wish to express our approval of this action and to urge that future action should be such as to permit and encourage the continuation of a policy for the control of information in the field of atomic energy which would be not only prudent, but also enlightened and forward looking.

R. F. BACHER

A. H. COMPTON

E. O. LAWRENCE

J. R. OPPENHEIMER

F. H. SPEDDING

H. C. UREY

RICHARD C. TOLMAN
Chairman, Committee on
Declassification

ROLES OF INDIVIDUAL COMMITTEE MEMBERS IN ATOM BOMB PROJECT

Dr. R. F. Bacher was chief of one of the most important and secret divisions of the work at Los Alamos where the bomb was developed. He has just rejoined the faculty of Cornell University, Ithaca, New York, where he is Professor of Physics.

Dr. A H. Compton was Director of the University of Chicago Metallurgical Project which developed the manufacture of plutonium. He is now Chancellor of Washington University in St. Louis.

Dr. E. O. Lawrence is Director of the University of California Radiation Laboratory which developed the electro-magnetic method of separating Uranium 235. He is also Professor of Physics at the University of California in Berkeley.

Dr. J. R. Oppenheimer was Director of the Los Alamos Laboratory where the atomic bomb was itself developed. At the present time he is Professor of Physics at the California Institute of Technology in Pasadena.

Dr. F. H. Spedding is Director of the Iowa State College Laboratory which, among other things, developed the successful method for the production of uranium metal. Dr. Spedding is also Professor of Chemistry at the Iowa State College in Ames.

Dr. H. C. Urey was Director of the Columbia University Project which developed the diffusion method of separating Uranium 235. He is now a member of the Staff of the Institute of Nuclear Physics at the University of Chicago.

Dr. Richard C. Tolman was Vice-Chairman of the National Defense Research Committee and was also Scientific Advisor to General Groves. He has recently returned to the California Institute of Technology where he is Dean of the Graduate School.

END

August 2, 1945: The President and his party left Potsdam, and flew to Harrowbeer, near Plymouth. Byrnes flew in a separate plane from the President.

The President first went aboard the cruiser Augusta, which was to take him home and then went with others to the battleship RENOWN where he was greeted by King George VI who was host at luncheon.

Those present included Admiral Leahy, Secretary Byrnes, Viscount Halifax, Lord Lascelles, Admiral Leatham and Capt. Campbell. Leahy talked with the King about the atom bomb (Leahy's book, Page 430). Leahy did not think it would be as effective as expected - "it sounds like a professor's dream to me."

Byrnes wrote later (in his book,) that the King had learned from Churchill about the bomb test and was eager to know all about it. He said most of the luncheon conversation was devoted to the bomb. He said the only skeptical one was Leahy and that the King joked with him about his skepticism.

The President and his party returned to the AUGUSTA and the King then came aboard for a brief farewell.

August 5 - Word was received aboard the ship, then on the Atlantic of the death of Senator Hiram Johnson.

August 6. News of the Hiroshima bombing was received aboard the ship. Byrnes and Leahy wrote of this. Leahy added (Page 432) that "only the British, the Dominion of Canada and ourselves had any information regarding details of the manufacture of this atomic weapon.

August 7 - The President landed at Newport News and returned by train to Washington, arriving at 10:30 p.m. (See EAA diary).

Kichisaburo Nomura, former Jap ambassador to US warned Japanese not to expect any compromise of the allies surrender terms. He characterized the Potsdam ultimatum as height of impertinence. Tokyo radio broadcast.

August 8 - Moscow announced Soviet entry into war with Japan.

August 9 - Nagasaki bombed; second atom bomb.

August 10 - Japan sued for peace.

Smyth report on atomic bomb released.

B File

August 6, 1951

On Saturday, August 4th, I saw the President at his office about 10:40 AM and he told me about his first knowledge and connection with the atomic bomb development.

He said that his first connection with it was when he was serving in the Senate as a Member of the Appropriations Committee and the first appropriation for the atomic project came before the Committee. The appropriation request did not disclose the nature of the project and shortly afterward the President, in his investigation of the war effort, ordered an investigator to go down to Oak Ridge.(?) Immediately afterward he said Secretary of War Stimson called him and said he wanted to come over and see the President. The President said he offered to go over to Stimson's office and they got together. Stimson did not tell the President what the project was but did tell him that it concerned the most top secret in the Government and they wanted to go ahead without disclosing any information. On Stimson's assurances, the President called off his investigator and did not go further into the matter.

Immediately after he became President — the President recalls that it was, he thought, the day after he was sworn in, James F. Byrnes, who had been Director of War Mobilization and Fred M. Vinson, who was to succeed him, came to see him and told him for the first time about the project and its purpose. On April 25, Stimson had an appointment with the President and at that time he told Mr. Truman all about the project. Stimson later described this in his book, "On Active Service in Peace and War".

The President said that on July 16th, while he was at Potsdam for the conference with Churchill and Stalin, the message was received that the first test of the bomb had been made at Alamagordo, New Mexico, and had been successful. He said it was an almost "ecstatic" message and told how the explosion of the bomb had made a hole in the earth 1200 feet in diameter, had melted the steel tower from which the bomb was dropped and fused the sand on the desert floor about the scene.

"Then," the President said Stimson and I began to discuss the use of the bomb. It was my suggestion that we pick out a place to drop it as near a war plant as possible so as not to injure any more people than necessary. He said he conferred not only with Stimson but with Byrnes and Admiral Leahy and the decision was reached to drop the bombs on Hiroshima and Nagasaki. The President said that the military leaders believed, up to that time, that it would require an army of at least a million Americans to defeat Japan and they told the President, in answer to his inquiries that they estimated there would be about 25% casualties. He said he asked what the population of Hiroshima was and his recollection was that they said about 60,000. He said that he felt and said it was far better to kill 60,000 Japanese than to have 250,000 Americans killed and he, therefore, ordered the dropping of the bomb on Hiroshima and Nagasaki.

B File

JUL 18, 1945.

Admiral Leahy wrote (Page 383) that the Joint Chiefs of Staff in meetings on June 14, 15 and 29, with the addition of a long White House conference with the President on June 18, adopted the basic plans that became, with some modifications, the military Report of the Potsdam Conference. He said it was agreed to seek the earliest date the unconditional surrender of the Japanese and pending the President's approval, it was decided on June 14 that invading and seizing objectives in the Japanese home islands would be the main effort.

He wrote that the Joint Chiefs also agreed to encourage Russian entry into the war "in accordance with the contingent conditions accepted by Roosevelt at Yalta. He wrote that Stalin had told Harry Hopkins he expected the Russian forces to be in position to attack by August 8.

Leahy wrote (Page 384) that the White House conference was held primarily to discuss the necessity and practicability of invading the Japanese home islands. He said Marshall and King both strongly advocated the invasion of Kyushu at the earliest possible date. Leahy had been opposed to invasion of the Jap mainland. Marshall held that such an attempt on Kyushu would cost in casualties not more than ~~HIGH~~ 63,000 of the 190,000 combatant troops estimated as necessary for the invasion.

Leahy says the President approved the Kyushu operation but withheld for later consideration a general invasion of Japan.

June 29th meeting of the Joint Chiefs set November 1 as the invasion date for Kyushu and the JCS insisted on stating that this operation was to get into position for the decisive invasion of industrial Japan through the Tokyo plain.

Truman-Bomb.

June, 1945. The Interim Committee recommended that the bomb should be used against Japan, without specific warning, as soon as possible, and against such a target as would make clear its devastating strength. (Stimson says this in his book, Page 617). (Byrnes in his book, "Speaking Frankly", Page 261, gives the date of this recommendation as July 1, which apparently ~~was~~ is incorrect. He says that with the exception of Bard, the committee recommended that it be used without warning and he says this last question had been carefully considered).

B Fil

JUNE 10, 1945.

The Joint Chiefs of Staff held a special meeting to hear details of the pending Pacific operation to defeat the Japanese, prepared by the planning staff. These plans contemplated invasion of the Japanese mainland. Leahy wrote that none then knew the potentialities of the atomic bomb but it was his opinion and he urged it strongly on the Joint Chiefs that no major invasion of the Japanese mainland was necessary to win the war. He writes: "The JCS did order the ~~premature~~ preparation of plans for an invasion but the invasion itself was never authorized." (page 245).

July 7, 1945.

Truman and party leave Newport News at 7 a.m. on the AUGUSTA (the same ship on which FDR met Churchill off Newfoundland in August, 1941, when the Atlantic Charter was announced.)

July 15, 1945.

Truman arrived at Antwerp, Belgium at 10:00 a.m.
Ministers & Ambassadors U.S. Ambassador C.E. Sawyer & Mrs. Sawyer,
Admiral Harold Stark, Lieut. Gen. Lee and
General Eisenhower boarded the ship to greet the President.
are adsee areare
11 a.m., left the ship and drove to airfield near Brussels
and there took off in President's plane at 12:55 p.m.
and flew to Gatow airfield near Potsdam.
Greeted by Army guard of honor. Then drove ten miles to
houses prepared at Grebnitz Lake.

July 16, 1945.

Stalin delayed opening session of conference put over
a day.
Truman, Leahy and Byrnes toured Berlin, sightseeing.
ATOM BOMB successfully tested at Alamagordo, New Mexico
and result of test sent to Stimson at Potsdam.
(Did Stimson tell HST that night?
Churchill meets Truman for first time.

July 17, 1945.

Stalin arrived at Potsdam; conference opened.
Group of scientists (67?) petitioned Truman not to use
atom bomb against Japan without advance warning. (LOOK)

July 16-26, 1945

Some time during this period - probably on the 16th

s of:
A Ayers

Truman-Bomb



July 24, 1945..

Potsdam: At the plenary session on July 24, Truman walked over to Stalin and (in the words of Leahy) "told him quietly that we had developed a powerful weapon more potent than anything yet seen in war. The President said later that Stalin's reply indicated no special interest and that the Generalissimo did not seem to have any conception of what Truman was talking about. It was simply another weapon and he hoped we would use it effectively."

James Byrnes, in his book says that at the close of the Big Three meeting on July 24thn Truman walked around the big circular table to talk to Stalin and after a brief conversation he rejoined Byrnes and rode back to the house whebe they stayed. He says HST said he had told Stalin that after long experimentation we had developed a new bomb far more destructive than any other known bomb and that we intended to use it very soon unless Japan surrendered. Stalin's only reply, he said, was that he was glad to hear of the bomb and he hoped we would use it. Byrnes says he was surprised at Stalin's lack of interest and concluded he had not grasped its importance.

The President told me, in a talk August 6, 1951, that he told Stalin during the Potsdam conference that the U.S. had perfected a powerful new weapon. He said he did NOT tell Stalin that it was an atomic bomb or weapon. He said Stalin did not seem particularly impressed but he smiled and said that was fine.

D-File

May 29, 1957

Tentative chronology of part played by scientists in decision
to use the bomb against Japan

1. Early 1944 "Everyone took for granted that the new bombs would be used in Europe if they were ready in time." (Compton, p. 231; for complete references see attached bibliography)
2. Early 1944 The men on the metallurgical project beginning to think about the future of atomic energy. (Compton, p. 231)
3. Early 1944 H.D. Smyth presented A.H. Compton with an outline of major questions relating to future of atomic energy. (Compton, p. 232)
4. Summer, 1944 At request of Metallurgical Project Council the Jeffries Committee was appointed by Compton ~~xi~~ to study "postwar work on nucleonics." (Compton, p. 232)
5. Autumn, 1944 The Tolman Committee was appointed by Gen. Groves to look into future possibilities of atomic energy. Formed background for much of work of Interim Committee in spring of 1945. (Compton, p. 232)
6. Nov. 18, 1944 Jeffries Report, "Nucleonics Prospectus," was submitted to Compton with a covering letter (unpublished) signed by Enrico Fermi, James Franck, T.R. Hogness, Zay Jeffries, chairman, R.S. Mulliken, secretary, R.S. Stone, and C.A. Thomas.
7. Dec. 28, 1944 Tolman Committee handed its report to Gen. Groves on future of atomic energy (Compton, p. 233)
8. Early 1945 Conversations between Groves and A.H. Compton on use of bomb. Groves brings to Stimson's attention the concern of scientists about immediate use and long-term planning. (Compton, p. 233)
- 9 March, 1945 Szilard prepares memo. for Roosevelt (Szilard "memo")

Chronology --2-

10. April 1945 Compton appointed a committee of those best informed to consider "anticipated human, military and political consequences" of use of the bomb. Report of this committee was brought directly to Stimson (Compton and Daniels).

11. Spring 1945 Franck Committee at work. Referred to by Compton as "within our project, the subcommittee on social and political consequences headed by James Franck focused its attention on this problem [the use of bombs]." (Compton, p. 233)

12. Spring 1945 Szilard writes to the President and went to Washington to urge that the bomb not be used. (Compton, p. 241)

13. April 12, 1945 Stimson tells Truman briefly about new explosive after Truman is sworn into office. (Truman, p. 10)

14. April 13, 1945 Byrnes gives Truman more details; "later" Truman received a scientific account from Bush. (Truman, p. 10)

15. April 25, 1945 Stimson discusses with Truman the relation of the bomb to foreign policy and presents a memorandum discussing secrecy and international control. (Truman, pp. 85 and 87; Stimson & Bundy II p. 635ff)

16. April 1945 Appointment of Interim Committee by Truman "for recommending action to the executive and legislative branches." (Stimson "Decision")

17. May 28, 1945 Szilard presents his March memo (which had not reached Roosevelt before his death) to "James" Byrnes in a personal interview in Spartanburg. (Szilard, "Memo")

18. May 31, 1945 Interim Committee discusses use of the bomb. 1st meeting. Possibility of non-military demonstration brought up; Scientific panel asked to prepare a report on this. (Compton, pp. 219, 234)

19. June 1, 1945 Interim Committee after consultations with Scientific Panel unanimously decided: 1) bomb should be used against Japan as soon as possible 2) dual target, military and other buildings 3) should be used without prior warning. (Stimson, "Decision")

Chronology -3-

20. June 1, 1945 Conclusions of Int. Com. & Sc. Pan. brought to Truman by Stimson. (Truman, p. 419)
Ralph Bard later changed his views and dis-
sented from recommendation No. 3 of the
June 1st report. (Stimson, "Decision,")

21. June, 1945 "Eventually, in June, 1945, the suggestions
of these various subcommittees (of the
Jeffries Committee) were collected into a
combined report for the use of the Interim
Committee and its successors." (Compton,
p. 232)

22. About June 9, 1945 Scientific panel to Interim Commit-
tee (Lawrence, Fermi, Oppenheimer, and A.
H. Compton) to prepare report on possible
non-military demonstration. (Compton, p. 240)
met at 6 AM

23. June, 1945 Hearing that Truman was consulting Stimson
about use of the bomb, Franck "and certain
members of his committee hastened to draft
their conclusions." (Compton, p. 235)

24. June 11, 1945 Franck report presented to Stimson; drawn
up by committee of 3 physicists, 3 chemists,
and 1 biologist; "dispatched to Washington"
six days before test explosion. (Editorial,
Bull. At. Sc., May, 1946); Cf. Compton, p. 236
which states that Franck was in Washington,
but Stimson was away and report was left
for him with Geo. L. Harrison, his assist-
ant)

25. June 11-16, 1945 Interim Committee and its scientific
panel consider the Franck report (Stimson
states, "The Interim Committee and the
Scientific Panel also served as a channel
through which suggestions from other sci-
entists...were forwarded to me and to the
President. Among the suggestions thus
forwarded was one memorandum which question-
ed using the bomb at all against the enemy."
Stimson, "Decision")

26. June 16, 1945 Scientific Panel reports to Interim Com-
mittee that they can propose no technical
demonstration likely to end war and see
no alternative to direct military use.
(Stimson, "Decision,")

27. 1945 Szilard circulates petitions in Chicago; urges others to do so in Oak Ridge and Los Alamos, requesting that the atomic bomb should not be used in World War II. (Compton, p. 241)

28. see below
36-a Szilard petition in original form gets almost no support. Szilard turns revised petition over to Compton for delivery to Washington, indicating that it was signed by 67 scientists residing in Chicago. (Compton, pp. 241-42) (Szilard says about 55 signatures.)

29. Counter-petitions to Szilard's circulated at Chicago and Oak Ridge. (Compton, pp. 241-42)

30. July 2, 1945 Stimson sends memo to Truman discussing issue of strong warning to Japan of destruction if she does not surrender. Bomb not specifically mentioned 1) because of secrecy and 2) because not yet tested. (Stimson "Decision")

31. July 6, 1945 President's party, including Byrnes but not Stimson, leaves Washington for Potsdam (This and some of the following items are included as relevant because of the question of what key officials were in Washington to receive the opinions of scientists that were expressed after this date.)

32. July 12, 1945 Poll taken in Met Lab at Chicago. (Compton & Daniels)

33. July 15, 1945 Truman, Byrnes and others arrive in Berlin; greeted by Stimson at airport. (Truman, p. 339; on date of Stimson's arrival cf. also #35).

34. July 16, 1945 Bomb successfully tested at Alamogordo.

35. July 16, 1945 News of test flashed to Truman at Potsdam by Stimson. (Truman, p. 415; cf. Byrnes' statement, p. 262, that it took several days for decoding. Stimson & Bundy, II p. 637, says word of test was received at Potsdam on July 16th.)

36. July 17, 1945 Stimson flew to Potsdam and gave Truman full details of test (Truman, p. 415)

36-a July 17, 1945 Revised Szilard petition--Szilard says about 63 signatures.

37. July 17 to 24, 1945 Truman makes the decision to use the bomb against Japan when it is ready for delivery unless surrender has taken place. Truman does not date this decision exactly, but says as soon as he received details of test from Stimson on July 17th he called together chiefs of staff to review military strategy in light of successful test. (p. 415) Truman also says when he talked with Churchill he favored use of bomb (p. 419) Compton (p. 245) says that Truman later told him that it was at that meeting with the Joint Chiefs that he gave his "formal assent" to use of bomb.

38. July 17, 1945 As soon as Stimson arrived in Potsdam, (Truman here uses the date given in #36) Truman called in Byrnes, Leahy, Marshall, Gen. Arnold and Adm. King; they reviewed military strategy in light of the successful test. (Truman, pp. 419-21)

39. July 23, 1945 Col. Nichols asks Compton at Oak Ridge for results of the poll at the Met. Lab. C. wrote out a message summarizing the results of the "votes and petitions" as objectively as he could. An hour later Nichols came back wanting to know what C. himself thought; gave opinion favoring use. (Compton, p. 246)

40. July 24, 1945 The War Department "was given orders" to instruct Gen. Spaatz that first bomb would be dropped as soon after August 3rd as weather permits. Truman told Stimson that order to Spaatz would stand unless Truman notified him of favorable Japanese reply. (Truman, pp. 420-21)

41. July 24, 1945 Truman tells Stalin of "new weapon of unusual destructive force." (Truman, p. 416)

42. July 26, 1945 Allies broadcast demand that Japan surrender or face destruction.

43. July 28, 1945 Premier of Japan rejects Potsdam ultimatum as unworthy of notice. (Stimson, "Decision"; Truman, p. 421)

Chronology -6-

44. between decision to use bomb and leaving Potsdam Truman authorizes statement to be released after first bomb is dropped. (Truman, pp. 422-23)

45. August 2, 1945 Truman leaves Potsdam; flies to England; home by ship. (Truman, pp. 406, 421, ff.)

46. August 3, 1945 1st day scheduled for dropping bomb, weather permitting. (Truman, p. 421.)

47. August 6, 1945 Hiroshima bombed (Aug. 5th at 7:15P.M., Washington time, Truman, p. 421)

48. August 8, 1945 Molotov informed Amb. Harriman in Moscow that Russia would consider itself at war with Japan as of Aug. 9th. Truman received this news on August 8th and immediately announced it at press conference. (Truman, p. 425)

49. August 9, 1945 Nagasaki bombed. ("We gave the Japanese three days in which to make up their minds to surrender, and the bombing would have been held off another two days had weather permitted." Truman, p. 426)

50. August 10, 1945 Japanese offer surrender on Potsdam terms but with reservation about sovereignty of emperor. (Stimson, "Decision")

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24 July 1945

MEMORANDUM FOR GENERAL ARNOLD

SUBJECT: Groves Project

1. The following plan and schedule for initial attacks using special bombs have been worked out:

a. The first bomb (gun type) will be ready to drop between August 1 and 10 and plans are to drop it the first day of good weather following readiness.

b. The following targets have been selected: Hiroshima, Kokura, Niigata and Nagasaki.

(1) Hiroshima (population 350,000) is an "Army" city; a major PCE; has large QM and supply depots; has considerable industry and several small shipyards.

(2) Nagasaki (population 210,000) is a major shipping and industrial center of Kyushu.

(3) Kokura (population 178,000) has one of the largest army arsenals and ordnance works; has the largest railroad shops on Kyushu; and has large munitions storage to the south.

(4) Niigata (population 150,000) is an important industrial city, building machine tools, diesel engines, etc., and is a key port for shipping to the mainland.

c. All four cities are believed to contain large numbers of key Japanese industrialists and political figures who have sought refuge from major destroyed cities.

d. The attack is planned to be visual to insure accuracy and will wait favorable weather. The four targets give a very high probability of one being open even if the weather varies from that forecast, as they are considerably separated.

RECORDED

a. The bomb will be carried in a B-29 airplane unaccompanied by two other project B-29's with observers and optional instruments.

b. The three B-29's will take off from Iwakuni, Japan, and fly via Iwo Jima. The use of fighters escort will be determined by General Spaatz upon consideration of additional factors.

c. The master plane will normally be selected to fly at 10,000 feet plus altitude and will maintain this altitude until it has made a steep diving turn away from the target. No altitude maximum limit range will be established as practicable. Supporting planes and fighters if employed will be kept several miles from the target. The participating planes are believed to be safe from the effects of the bomb.

d. The bomb will be detonated by timer proximity fuse about 2,000 feet above the ground.

e. Emergency arrangements have been provided at Iwo Jima for handling the bomb if required.

f. Two tested type bombs are expected to be available in August, one about the 6th and another the 25th. General Spaatz expects to have more information on future availability in a few days which will be furnished you when received.

g. The above has been discussed with Generals Spaatz and Barker who concur.

JOHN N. TONE
Colonel, CSC

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Vertical File

TOP SECRET

12 May 1945

Memorandum For: Major General L. R. Groves

No. 134-4-A
U-13-XIX-1A

Subject: Summary of Target Committee Meetings on 10 and 11 May 1945

1. The second meeting of the Target Committee convened at 9:00 AM on 10 May in Dr. Oppenheimer's office at Site Y with the following present:

General Farrell	Dr. C. Lauritsen
Colonel Seeman	Dr. Ramsey
Captain Parsons	Dr. Dennison
Major Derry	Dr. Von Neumann
Dr. Stearns	Dr. Wilson
Dr. Tolman	Dr. Penney
Dr. Oppenheimer	

Dr. Bethe and Dr. Brode were brought into the meeting for discussion of Item A of the agenda. During the course of the meeting panels were formed from the committee members and others to meet in the afternoon and develop conclusions to items discussed in the agenda. The concluding meeting was held at 10:00 AM on 11 May in Dr. Oppenheimer's office with the following present:

Colonel Seeman	Dr. Stearns
Captain Parsons	Dr. Von Neumann
Major Derry	Dr. Dennison
Dr. Tolman	Dr. Penney
Dr. Oppenheimer	Dr. Ramsey
	Dr. Wilson

2. The agenda for the meetings presented by Dr. Oppenheimer consisted of the following:

- A. Height of Detonation
- B. Report on Weather and Operations
- C. Gadget Jettisoning and Landing
- D. Status of Targets
- E. Psychological Factors in Target Selection
- F. Use Against Military Objectives
- G. Radiological Effects
- H. Coordinated Air Operations

- continued on next page -

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2. The agenda for the meetings --- continued:

T. Rehearsals

J. Operating Requirements for Safety of Airplanes

K. Coordination with 21st Program

3. Height of Detonation

A. The criteria for determining height selection were discussed. It was agreed that conservative figures should be used in determining the height since it is not possible to predict accurately the magnitude of the explosion and since the bomb can be detonated as much as 40% below the optimum with a reduction of 25% in area of damage whereas a detonation 1/5 above the optimum will cause the same loss in area. It was agreed that fuses should be prepared to meet the following possibilities:

- (1) For the Little Boy the detonation heights should correspond to a pressure of 5 psi, a height of the Mach-stem of 100 feet and a magnitude of detonation of either 5,000 or 15,000 tons of H.E. equivalent. With present knowledge the fuse setting corresponding to 5,000 tons equivalent would be used but fusing for the other should be available in case more is known at the time of delivery. The heights of detonation corresponding to 5,000 and 15,000 tons are 1550 feet and 2400 feet, respectively.
- (2) For the Fat Man the detonation heights should correspond to a pressure of 5 psi, a height of the Mach-stem of 100 feet, and a magnitude of explosion of 700, 2,000, or 5,000 tons of H.E. equivalent. With the present information the fuse would be set at 2,000 tons equivalent but fusing for the other values should be available at the time of final delivery. The heights of detonation corresponding to 700, 2,000, and 5,000 tons are 580 foot, 1,000 feet and 1,550 feet, respectively. Trinity data will be used for this gadget.

B. In the case of the Fat Man delay circuits are introduced into the unit for other purposes which make the detonation of the bomb 450 feet below the height at which the fuse is set. For this reason as far as the Fat Man is concerned the fuse settings should be 950 feet, 1,400 feet, or 1,950 feet.

C. In view of the above it was agreed by all present that fuses should be available at four (4) different height settings. These heights are 1,000 feet, 1,400 feet, 2,000 feet and 2,400 feet. With present information the 1,400 foot fuse would be most likely to be used for both the Fat Man and the Little Boy. (Later data presented by Dr. Ercia modify the above conclusions on fusing and detonating heights; the differential height for the Little Boy is 210 feet; for the Fat Man 500 feet. For this reason some of the above figures must be revised).

4. Report on Targets and Operations

A. Dr. Dennison reported on the above subject. His report essentially covered the materials in his Top Secret memo of 9 May - Subject: "Preliminary Report on Operational Procedures". For this reason his report will not be repeated here but is attached as an appendix. It was agreed by those present that the mission if at all possible should be a visual bombing mission. For this we should be prepared to wait until there is a good weather forecast in one or more of three alternative targets. There is only a 2% chance in this case that we will have to wait over two weeks. When the mission does take place there should be spotter aircraft over each of three alternative targets in order that an alternative target may be selected in the last hour of flight if the weather is unsatisfactory over the highest priority target.

B. In case the aircraft reaches the target and finds, despite these precautions that visual bombing is impossible, it should return to its base provided it is in good operating condition. Only if the aircraft is in sufficiently bad shape that it is unlikely that it can return to base and make a safe landing or if it is essential that the drop be made that day should the drop be made with radar equipment. For this purpose it may be desirable to have an Eagle radar equipped airplane accompany the mission in order that formation bombing with the Eagle plane in the lead can be made to obtain the increased accuracy from Eagle. A final decision as to the desirability of this emergency procedure can only be made after further combat experience is obtained with Eagle aircraft. In any case every effort should be made to have the mission such that blind bombing will be unnecessary.

C. It was agreed that Dr. Stearns and Dr. Dennison should keep themselves continuously informed as to radar developments. If at any time new developments are available which show in combat a marked improvement of accuracy the basic plan may be altered.

D. It was agreed that Shoran was a very promising development for the 21st Bomber Command but that we should make no plans to use Shoran until its success is fully confirmed in normal bombing missions in that area.

E. The plan to use the gadget with visual bombing even though this may require a one day to three weeks delay requires that the gadget be such that for a period of at least three weeks it can be held in readiness in such a state that on twelve hours notice it can be prepared for a combat mission. No difficulty in this regard was foreseen by those present.

5. Gadget Jettisoning and Landing

A. It was agreed that if the aircraft has to return to its base with the gadget and if it is in good condition when it has reached there, it should make a normal landing with the greatest possible care and with such precautions as stand-by fire equipment being held in readiness on the ground. This operation will inevitably involve some risks to the base and to the other aircraft parked on the field. However, the chance of a crash when the aircraft is in good condition and the chances of the crash initiating a high order explosion are both sufficiently small that it was the view of those present that the landing operation with the unit under these circumstances was a justifiable risk. Frequent landings with inert and H.E. filled units have been made in the past. Training in landing with the unit should be given to all crews who carry an active unit.

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5. Quick Jettisoning and Landing

continued

B. In case the aircraft returns to its base and the funds will not permit make a normal landing it may be necessary to jettison the bomb. In the case of the Fat Man this can probably best be accomplished by jettisoning the bomb into shallow water from a low altitude. Tests on this will be carried out with both inert and live units. In the case of the Little Boy the situation is considerably more complicated since water leaking into the Little Boy will set off a nuclear reaction, and since the American held territory in the vicinity of the base is so densely filled that no suitable jettisoning ground for the Little Boy has been found which is sufficiently devoid of moisture, which is sufficiently soft that the projectile is sure not to burst from the impact, and which is sufficiently remote from extremely important American installations whose damage by a nuclear explosion would seriously affect the American war effort. The best emergency procedure that has so far been proposed is considered to be the removal of the gun powder from the gun and the execution of a crash landing. In this case there is no danger of fire setting off the gun and the accelerations should be sufficiently small to prevent bursting of the projectile by the impact. Tests on the feasibility of unloading the gun powder in flight will be conducted.

C. It was agreed that prior to actual delivery some form of instructions should be prepared as a guide to the senior man on the aircraft as to procedures to be followed in cases of different types of disasters.

5. Status of Targets

A. Dr. Stearns described the work he had done on target selection. He has surveyed possible targets possessing the following qualifications: (1) they be important targets in a large urban area of more than three miles diameter, (2) they be capable of being damaged effectively by a blast, and (3) they are likely to be unattacked by next August. Dr. Stearns had a list of five targets which the Air Forces would be willing to reserve for our use unless unforeseen circumstances arise. These targets are:

- (1) Kyoto - This target is an urban industrial area with a population of 1,000,000. It is the former capital of Japan and many people and industries are now being moved there as other areas are being destroyed. From the psychological point of view there is the advantage that Kyoto is an intellectual center for Japan and the people there are more apt to appreciate the significance of such a weapon as the gadget. (Classified as an A1 Target)
- (2) Hiroshima - This is an important army depot and port of embarkation in the middle of an urban industrial area. It is a good radar target and it is such a size that a large part of the city could be extensively damaged. There are adjacent hills which are likely to produce a focusing effect which would considerably increase the blast damage. Due to rivers it is not a good incendiary target. (Classified as an A1 Target)

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6. Status of Targets - continued

(3) Yokohama - This target is an important urban industrial area which has so far been untouched. Industrial activities include aircraft manufacture, machine tools, desks, electrical equipment and oil refineries. As the damage to Tokyo has increased additional industries have moved to Yokohama. It has the disadvantage of the most important target areas being separated by a large body of water and of being in the heaviest anti-aircraft concentration in Japan. For us it has the advantage as an alternative target for use in case of bad weather or being rather far removed from the other targets considered. (Classified as an A Target)

(4) Kokura Arsenal - This is one of the largest arsenals in Japan and is surrounded by urban industrial structures. The arsenal is important for light ordnance, anti-aircraft and beach land defense materials. The dimensions of the arsenal are 4100' x 2000'. The dimensions are such that if the bomb were properly placed full advantage could be taken of the higher pressures immediately underneath the bomb for destroying the more solid structures and at the same time considerable blast damage could be done to more feeble structures further away. (Classified as an A Target)

(5) Niigata. - This is a port of embarkation on the N.W. coast of Honshu. Its importance is increasing as other ports are damaged. Machine tool industries are located there and it is a potential center for industrial dispersion. It has oil refineries and storage. (Classified as a B Target)

(6) The possibility of bombing the Emperor's palace was discussed. It was agreed that we should not recommend it but that any action for this bombing should come from authorities on military policy. It was agreed that we should obtain information from which we could determine the effectiveness of our weapons against this target.

B. It was the recommendation of those present at the meeting that the first four choices of targets for our weapon should be the following:

- a. Kyoto
- b. Hiroshima
- c. Yokohama
- d. Kokura Arsenal

C. Dr. Stearns agreed to do the following: (1) brief Colonel Fisher thoroughly on these matters, (2) request reservations for these targets, (3) find out more about the target area including exact locations of the strategic industries there, (4) obtain further photo information on the targets, and (5) to determine the nature of the construction, the area, heights, contents and roof coverage of buildings. He also agreed to keep in touch with the target data as it develops and to keep the committee advised of other possible target areas. He will also check on locations of small military targets and obtain further details on the Emperor's palace.

THE ATOMIC BOMB

On April 25, 1945, Secretary of War Henry L. Stimson had an appointment with the President at the White House. Stimson later, in his book "On Active Service In Peace And War" wrote:

"When Stimson went to the White House on April 25, 1945, to discuss the atomic bomb with a President from whom hitherto the matter had been kept secret, he took with him a memorandum which dealt not so much with the military use of the bomb as with its long-range political meaning."

In his book Stimson quoted the memorandum as follows:

"1. Within four months we shall in all probability have completed the most terrible weapon ever known in human history, one bomb of which could destroy a whole city.

"2. Although we have shared its development with the U.K., physically the U.S. is at present in the position of controlling the resources with which to construct and use it and no other nation could reach this position for some years.

"3. Nevertheless it is practically certain that we could not remain in this position indefinitely.

"a. Various segments of its discovery and production are widely known among many scientists in many countries, although few scientists are now acquainted with the whole process which we have developed.

"b. Although its construction under present methods requires great scientific and industrial effort and raw materials, which are temporarily mainly within the possession and knowledge of U.S. and U.K., it is extremely probable that much easier and cheaper methods of production will be discovered by scientists in the future, together with the use of materials of much wider distribution. As a result, it is extremely probable that the future will make it possible to be constructed by smaller nations or even groups, or at least by a large nation in a much shorter time.

"4. As a result, it is indicated that the future may see a time when such a weapon may be constructed in secret and used suddenly and effectively with devastating power by a willful nation or group against an unsuspecting nation or group of much greater size and material power. With its aid even a very powerful unsuspecting nation might be conquered within a very few days by a very much smaller one. . . .

"5. The world in its present state of moral advancement compared with its technical development would be eventually at the mercy of such a weapon. In other words, modern civilization might be completely destroyed.

"6. To approach any world peace organization of any pattern now likely to be considered, without an appreciation by the leaders of our country of the power of this new weapon, would seem to be unrealistic. No system of control heretofore considered would be adequate to control this menace. Both inside any particular country and between the nations of the world, the control of this weapon will undoubtedly be a matter of the greatest difficulty and would involve such thorough-going rights of inspection and internal controls as we have never heretofore contemplated.

"7. Furthermore, in the light of our present position with reference to this weapon, the question of sharing it with other nations and, if so shared, upon what terms, becomes a primary question of our foreign relations. Also our leadership in the war and in the development of this weapon had placed a certain moral responsibility upon us which we cannot shirk without very serious responsibility for any disaster to civilization which it would further.

"8. On the other hand, if the problem of the proper use of this weapon can be solved, we would have the opportunity to bring the world into a pattern in which the peace of the world and our civilization can be saved.
...".

In outlining the history of the development of the atomic bomb in his book, Stimson referred to a paper which he published in February, 1947, in Harper's Magazine and he quoted at length from that article.

He said that it was in the Fall of 1941 that the question of atomic energy was first brought directly to his attention. At that time President Henry Roosevelt appointed a committee consisting of Vice President Wallace, General Marshall, Dr. Vannevar Bush, President of the Carnegie Institute of Washington, Dr. James B. Conant, President of Harvard University and himself to advise the President on questions of policy relating to the study of nuclear fission which was then proceeding both in the United States and Great Britain. He said that from May 1, 1943, until his resignation as Secretary of War on September 21, 1945, he was directly responsible to the President for administration of the entire undertaking with General Marshall, Bush, Conant and Major General Leslie R. Groves, the Officer-in-charge of the project, as his chief advisor.

He said the policy adopted and steadily pursued by Roosevelt and his advisors was to spare no effort in securing the earliest possible successful development of an atomic weapon. The original experimental achievement of atomic fission, he pointed out, had occurred in Germany in 1938 and it was known that the Germans had continued their experiments. In 1941 and 1942 they were believed to be ahead of us and it was vital that they should not be the first to bring atomic weapons into the field of battle.

"At no time, from 1941 to 1945," Stimson wrote, "did I ever hear it suggested by the President or by any other responsible member of the Government that atomic energy should not be used in the war." He said the entire purpose of the project was production of a military weapon; "on no other ground could the war-time expenditure of so much time and money have been justified."

Stimson, in addition to general supervision of the work of General Groves, became Chairman of a combined policy committee, composed of British and American officials and responsible directly to the President and Prime Minister Churchill.

Until 1944, Stimson said work on the atom was financed from funds "elastically" available from other appropriations but as expenditure increased it was decided that direct appropriation would be necessary. Therefore, in February, 1944, Stimson, Marshall and Bush took it up with Speaker Rayburn and Representatives McCormack and Martin, Democratic and Republican Leaders of the House, who piloted the necessary appropriation through the House without public discussion. A meeting in June with Senators Barkley, White, Bridges and Thomas of Oklahoma, brought similar results in the Senate. In 1945 additional large appropriations were likewise obtained.

Stimson said that as time went on it became clear that the weapon would not be available in time for use in an European war and that war was successfully ended without it. In the Spring of 1945, however, it became evident that the climax of the effort was nearing but it was impossible to state with certainty that success had been achieved until a bomb was actually exploded. A test was to be made at the Alamogordo Reservation in New Mexico.

On March 15, 1945, Stimson said he had his last talk with President Roosevelt. He said he took with him a memorandum which the President had sent him from an unnamed person "who had been alarmed at the rumors of extravagance in the Manhattan Project." This man suggested that a body of outside scientists be formed to pass upon the project because there were rumors that Bush and Conant had "sold the President a lemon on the subject and ought to be checked upon." He said it was a rather jittery and nervous memorandum and rather silly but that he was prepared for it and gave the President a list of the scientists who were actually engaged on the project to show their high standing. The list he said comprised four Nobel prize men

and practically every physicist of standing. He said he then outlined the future of it, and "went over with him the two schools of thought that exist in respect to the future control after the war of this project, in case it is successful, one of them being the secret close-in attempt to control the project by those who control it now, and the other being the international control based upon freedom both of science and of access." He told him that those things must be settled before the first projectile is used and that he must be ready with a statement to come out with the people on it just as soon as that is done. He agreed to that."

He said the conversation covered the three aspects of this question then uppermost in their minds — first that it was always necessary to suppress a lingering doubt that such a titanic undertaking could be successful; second the implications of success in terms of a long-range post-war effect; third the problem that would be presented at the time of the first use of the weapon, for with that first use he said there must be some public statement.

In April, Stimson set up a committee, charged with the functions of advising the President on the various questions raised "by our apparently imminent success in developing an atomic weapon." The committee, known as the Manhattan Committee consisted of Stimson as Chairman, George L. Harrison, who acted as Chairman in Stimson's absence; James F. Byrnes, then a private citizen, as personal representative of the President; Ralph A. Bard, Under Secretary of the Navy; William L. Clayton, Assistant Secretary of State; Dr. Vannevar Bush, Director of the Office of Scientific Research & Development, and President of the Carnegie Institute of Washington; Dr. Karl T. Compton, Chief of the Office of Scientific Research & Development, and President of Massachusetts Institute of Technology, and Dr. James B. Conant, Chairman of the National Defense Research Committee, and President of Harvard University.

D. K. (united)

The committee's work included the drafting of statements issued immediately after the first bombs were dropped, preparation of a bill for domestic control of atomic energy, and recommendations looking toward international control of atomic energy.

On June 1st, this committee recommended that the bomb be used against Japan, without specific warning, as soon as possible and against such a target as to make its devastating strength clear.

Stimson wrote that an advisory panel of the distinguished atomic physicists reported that they could propose no technical demonstration likely to bring an end to the war -- "we see no acceptable alternative to direct military use." Stimson said that the conclusions of the committee were similar to his own although he reached his independently and he felt that to extract a genuine surrender from the Japanese Emperor and his military advisors there must be administered a tremendous shock which would carry convincing truth of our power to destroy the Empire. He felt such an effective shock "would save many times the number of lives, both American and Japanese, that it would cost." He set forth an argument in support of his opinion which opinion he said was held not only by himself but by all his senior military advisors.

In July, 1945, although Japan had been seriously weakened, he said there was no indication of any weakening in the determination to fight rather than to accept unconditional surrender. Estimates of the War Department General Staff indicated that the Japanese army had a total strength of about five million men and there was a warm possibility that the Japanese Government might determine upon resistance to the end which would face the Allies with the task of destroying an armed force of five million men and five thousand suicide aircraft. Plans of the armed forces for the defeat of Japan had been prepared without reliance upon the atomic bomb. They included an intensified sea and air blockade, strategic air bombing through the summer and early fall to be

followed on November 1st by invasion of the southern island of Kyushu. This to be followed by an invasion of the main island of Honshu in the Spring of 1946. The total United States military and naval force of five million men would be involved. He said they estimated that if we should be forced to carry this plan to a conclusion with major fighting it would not end until the latter part of 1946 at the earliest. With these thoughts in mind he wrote a memorandum for the President on July 2nd. This was prepared after general discussion and agreement with Joseph C. Grew, Acting Secretary of State and Secretary of the Navy Forrestal. He said this was prompted not by the problem of atomic energy but by American desire to achieve a Japanese surrender without invading the home island.

The memorandum was of considerable length and bore the title "Proposed Program For Japan" and did not mention the atomic bomb. It would propose a carefully-timed warning to Japan before the invasion of the Empire was attempted. He said there was much discussion in Washington about the timing of this warning and that the controlling factor in the end was the date set for the Potsdam Conference. He said it was President Truman's decision that such a warning should be issued by the United States and the United Kingdom from this meeting, with the concurrence of the Head of the Chinese Government so that it would be plain that all Japan's enemies were united. This was done in the Potsdam ultimatum of July 26th. On July 28th, the Japanese Premier rejected the ultimatum.

The New Mexico test of the atomic bomb occurred on July 16th while the President was at Potsdam.

He said a list of suggested targets for the atom bomb was made up and he approved four, including the cities of Hiroshima and Nagasaki. The former was bombed on August 6th and the latter on August 9th.

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President's Secretary's Files

UNITED STATES STRATEGIC BOMBING SURVEY



SUMMARY REPORT

(Pacific War)

WASHINGTON, D. C.

JULY 1946

B File

Foreword

The United States Strategic Bombing Survey was established by the Secretary of War on 3 November 1944, pursuant to a directive from the late President Roosevelt. It was established for the purpose of conducting an impartial and expert study of the effects of our aerial attack on Germany, to be used in connection with air attacks on Japan and to establish a basis for evaluating air power as an instrument of military strategy, for planning the future development of the United States armed forces, and for determining future economic policies with respect to the national defense. A summary report and some 200 supporting reports containing the findings of the Survey in Germany have been published. On 15 August 1945, President Truman requested the Survey to conduct a similar study of the effects of all types of air attack in the war against Japan.

The officials of the Survey in Japan, who are all civilians, were:

Franklin D'Olier, *Chairman.*
Paul H. Nitze,
Henry C. Alexander, *Vice Chairman.*
Harry L. Bowman,
J. Kenneth Galbraith,
Rensis Likert,
Frank A. McNamee, Jr.,
Fred Searls, Jr.,
Monroe E. Spaght,
Dr. Louis R. Thompson,
Theodore P. Wright, *Directors.*
Walter Wilds, *Secretary.*

The Survey's complement provided for 300 civilians, 350 officers, and 500 enlisted men. Sixty percent of the military segment of the organization for the Japanese study was drawn from the

Army, and 40 percent from the Navy. Both the Army and the Navy gave the Survey all possible assistance in the form of men, supplies, transport, and information. The Survey operated from headquarters in Tokyo, with subheadquarters in Nagoya, Osaka, Hiroshima, and Nagasaki, and with mobile teams operating in other parts of Japan, the islands of the Pacific, and the Asiatic mainland.

The Survey secured the principal surviving Japanese records and interrogated top Army and Navy officers, Government officials, industrialists, political leaders, and many hundreds of their subordinates throughout Japan. It was thus possible to reconstruct much of wartime Japanese military planning and execution, engagement by engagement and campaign by campaign, and to secure reasonably accurate data on Japan's economy and war production, plant by plant, and industry by industry. In addition, studies were made of Japan's over-all strategic plans and the background of her entry into the war, the internal discussions and negotiations leading to her acceptance of unconditional surrender, the course of health and morale among the civilian population, the effectiveness of the Japanese civilian defense organization and the effects of the atomic bomb. Separate reports will be issued covering each phase of the study.

In this Summary Report the civilian officials and directors of the Survey have not undertaken to write a history of the Pacific war, nor to apportion credit for victory among the various component Allied forces. They have undertaken, as civilians, to present an analysis of the factual material gathered by the Survey and their general appraisal thereof as to the future.

(iii)

B File

UNITED STATES STRATEGIC BOMBING SURVEY SUMMARY REPORT

The attack on Pearl Harbor was designed around surprise, the range of carrier task forces, and the power of aircraft to sink surface vessels. It was executed with the loss of 29 Japanese pilots. Two days later, the Japanese found the British battleship, *Prince of Wales*, and the battle cruiser, *Repulse*, without air cover off Malaya and sent them to the bottom with the loss of 4 Japanese Navy medium bombers. Allied air power in the Philippines, Malaya, and the Dutch East Indies was virtually eliminated, mostly on the ground, in a matter of days. Those enormous areas, once local Allied air power had been eliminated, were laid open to occupation in a matter of weeks, at a cost of less than 15,000 Japanese soldiers killed, and with the loss from all causes in the entire campaign of 381 Japanese planes.

As these achievements indicate, the Japanese started the war aware of the fact that major offensive action cannot be undertaken without local control of the air. They also appreciated the vulnerability to air attack of surface objectives, both on land and at sea. The Japanese failed, however, to appreciate the full scope and complexity of the requirements for continuing control of the air. The Japanese aircraft production program at the start of the war was inadequate, as the Japanese subsequently discovered, not only in relation to that of the United States, but even in relation to the capabilities of their own economy. Their planning and execution with respect to training, maintenance, logistics, technical development, intelligence and full coordination with their land and surface forces, were limited in relation to the requirements that subsequently developed. Japan's war plans did not contemplate, nor were its capabilities such that it could have contemplated, interference with the sustaining resources of United States air power.

December 7, 1941, found the United States and its Allies provocatively weak in the Pacific, particularly in land and carrier-based air power. The Allied air groups actually in the Pacific were not only few in number but, in large measure, technically inferior to those of the Japanese. The Japanese strength had been underestimated. Ninety

P-40s and 35 B-17s in the Philippines could not be expected to check the Japanese push southward. Three of our seven aircraft carriers were in the Atlantic and one training in the Gulf of Mexico. Even at that time, however, we had begun to see, more clearly than the Japanese, the full scope of the basic requirements for air power. Our programs for training, production, maintenance, logistics, and intelligence were limited, not so much by a lack of concept as by the time required for their development and fulfillment.

How the original Japanese advance was stopped, how we achieved air superiority, at first locally, but subsequently more and more generally, and over areas deep within the one-time Japanese dominated areas, culminating finally in air supremacy over the Japanese home islands themselves, and how that air superiority was exploited, is the story of air power in the Pacific war and the subject matter of this Summary Report. The role of air power cannot be considered separately, however, from the roles of ground and naval forces nor from the broad plans and strategy under which the war was conducted.

JAPAN'S ORIGINAL STRATEGIC PLAN

Japan's governmental structure provided no effective civilian control of her Army and Navy. In the years between the 1931 invasion of Manchuria and the 1941 attack upon Pearl Harbor, the military cliques of Japan exerted a progressively tighter control over the foreign and domestic affairs of the nation. These cliques included groups within both the Army and Navy, but because of the repeated military successes of the Japanese Army in Manchuria and China and the prestige so acquired, and because of the more ambitious and aggressive nature of the Japanese Army leaders, the political position of the Army was ascendant to that of the Navy. The final decision to enter the war and to advance into the Philippines, the Dutch East Indies, Malaya, Burma and to the southeast was, however, made with the full concurrence and active consent of all important Japanese Army and Navy leaders and of almost all her important civilian leaders.

This decision to which the Japanese were, in effect, committed by mid-October 1941 was based upon the following evaluation:

- a. The threat of Russia on the Manchurian flank had been neutralized by the decisive victories of Germany in Europe which might eventually lead to the complete collapse of the Soviet Union.
- b. Great Britain was in such an irretrievably defensive position that, even if she survived, her entire war-making potential would be spent in a desperate effort to protect her home islands.
- c. The forces which the United States and her Allies could immediately deploy in the Pacific, particularly in the air, were insufficient to prevent the fully trained and mobilized forces of Japan from occupying within three or four months the entire area enclosed within a perimeter consisting of Burma, Sumatra, Java, northern New Guinea, the Bismarck Archipelago, the Gilbert and Marshall Islands, Wake, and from there north to the Kuriles.
- d. China, with the Burma Road severed, would be isolated and forced to negotiate.
- e. The United States, committed to aiding Great Britain, and weakened by the attack on Pearl Harbor, would be unable to mobilize sufficient strength to go on the offensive for 18 months to 2 years. During this time, the perimeter could be fortified and the required forward air fields and bases established. So strengthened, this perimeter would be backed by a mobile carrier striking force based on Truk.
- f. While the stubborn defense of the captured perimeter was undermining American determination to support the war, the Japanese would speedily extract bauxite, oil, rubber and metals from Malaya, Burma, the Philippines and the Dutch East Indies, and ship these materials to Japan for processing, to sustain and strengthen her industrial and military machine.

g. The weakness of the United States as a democracy would make it impossible for her to continue all-out offensive action in the face of the losses which would be imposed by fanatically resisting Japanese soldiers, sailors and airmen, and the elimination of its Allies. The United States in consequence would compromise and allow Japan to retain a substantial portion of her initial territorial gains.

Certain civilian and naval groups were familiar with the United States, its industrial and technological potential, and probable fighting deter-

mination when aroused. They expressed doubts about a strategy which promised no conclusion to the war other than negotiation, and which thus might drag out interminably with consequent risk of defeat. The Navy, however, was gravely concerned about its declining oil supply after the United States and the British economic embargo of July 1941. Such civilians as were reluctant were overruled and went along with the more dynamic opinion.

None of the responsible Japanese leaders believed that within any foreseeable period of time Japan could invade the United States and dictate peace in the White House. Admiral Yamamoto's supposed boast that Japan would do so was in fact never made. These leaders furthermore felt that Japan's limited shipping would be strained to the utmost in providing logistic support for the plan adopted and would be wholly inadequate for any more ambitious program, unless the initial operations went unexpectedly well.

EXECUTION OF THE JAPANESE PLAN

In accordance with the above plan, the Japanese Army was given primary responsibility for conquering Malaya, Sumatra and Burma and, because of the limited range of its planes, for furnishing initial air support in northern Luzon only above 16° north latitude. The Japanese Navy was assigned primary responsibility, in addition to the attack on Pearl Harbor, for initially launching operations in the Philippines, Borneo, Celebes, Java, northern New Guinea, the Bismarck Archipelago and out to the Gilbert Islands and Wake. The Army was to assume control in the Philippines as soon as the landing forces were established ashore. On 7 December 1941 the Japanese Army and Navy air forces were accordingly disposed as follows:

Unit	Aircraft Strength	Deployment
ARMY		
Third Flying Division.....	550	Malayan Campaign.
Fifth Flying Division.....	175	Philippines Campaign.
First Flying Brigade.....	150	China.
Second Flying Division....	450	Manchuria (Reserve).
First Flying Division.....	50	Japan.
Total Army.....	1,375	

Unit	Aircraft Strength	Deployment
NAVY		
Twenty-first and Twenty-third Air Flotillas.	300	Philippines Campaign.
Twenty-second Air Flotilla.	150	Malayan Campaign.
Twenty-fourth Air Flotilla.	50	Marshalls.
Carrier Force (6 CVs).....	400	Pearl Harbor.
Combined Fleet.....	75	Seaplanes attached to surface vessels.
Miscellaneous.....	275	Japan.
Total Navy.....	1,250	
Grand Total.....	2,625	

The Japanese were not depending solely upon the volume of their air strength in these initial engagements, although they believed they possessed sufficient superiority in numbers over Allied air forces in the Pacific. More than on numbers, the Japanese relied on surprise and speed of advance, and upon the training and experience of their airmen. In 1941 the average first-line Japanese pilot had about 500-800 flying hours, and about 50 percent of Japanese Army pilots and 10 percent of Japanese Navy pilots had had actual combat experience in China or in border fighting with the Soviet Union in 1939. The carrier air groups were especially trained in shallow-water torpedo drops for the Pearl Harbor attack, and the Japanese Army air units were trained for support of ground operations in Malaya and the Philippines.

Facing the Japanese, the United States and its Allies had the following land-based air strength in the Pacific:

Country	Aircraft Strength	Deployment
U. S. Army and Navy Air Forces.	182	Philippines.
	12	Wake.
	12	Midway.
Royal Netherlands East Indies Air Forces.	387	Hawaii.
Royal Air Force.....	200	Netherlands East Indies.
Royal Australian Air Forces.	332	Malaya.
	165	Australia, Solomons, Netherlands East Indies, and Malaya.
Total Allied.....	1,290	

The majority of these planes were of obsolete types.

These forces were quickly overwhelmed. Fifty percent of the planes were destroyed on the ground. Our three lightly supported aircraft carriers in the Pacific did not constitute a sufficient force to warrant their being risked in those operations.

Following the initial successes at Pearl Harbor, Malaya and in the Philippines, Wake and Guam were occupied in December, and Rabaul in January. The Japanese gained air superiority in Burma with the loss of 102 planes and, with troops specially trained for jungle fighting, occupied that area at a cost of 7,000 soldiers killed. At the end of 4 months of war, they had carried out the substance of their initial program and with greater ease than they had foreseen. Total merchant shipping losses were 51 ships. Much of the equipment which had originally been scheduled for movement into the southern islands was found to be unnecessary and was left behind in order to achieve greater speed. Certain of the Japanese leaders were concerned by the skillful and unexpectedly determined resistance of our ground forces in the Philippines. They attributed this in part to inefficient Japanese close-air support. But in some circles, the skill and determination with which our isolated forces conducted the defense was correctly assessed as an ominous cloud on the horizon.

JAPANESE OVEREXTENSION

The magnitude of these successes encouraged the more daring Japanese planners to consider expansion beyond the original perimeter. During their discussions, the Doolittle raid of 18 April 1942 struck Tokyo. Although the damage caused was inconsequential, the reach of the attack supported a growing feeling that the Japanese perimeter would gain in strength if it had greater defense in depth.

Accordingly a new plan was approved, providing for (a) an advance into the Solomons and Port Moresby, to be followed, if successful, by a further advance into New Caledonia, Samoa and the Fiji Islands, (b) the capture of Midway, and (c) the temporary occupation of the Aleutians. Accomplishment of such a program would cut off the line of communication between Australia and the United States, reduce the threat from Alaska,

and deny the United States all major staging areas more advanced than Pearl Harbor.

By stretching and overextending her line of advance, Japan was committed to an expensive and exacting supply problem, she delayed the fortification of the perimeter originally decided upon, jeopardized her economic program for exploiting the resources of the area already captured, and laid herself open to early counter-attack in far advanced and, as yet, weak positions.

THE UNITED STATES PLAN BEFORE PEARL HARBOR

Prior to Pearl Harbor it had been decided that, in the event of war, Germany would have to be eliminated first, and that our initial role in the Pacific would, in large measure, be defensive. But Japan's offensive capabilities were underestimated; it was thought possible to hold the Malaya barrier, successfully engage the Japanese fleet in the Central Pacific, and lay the foundations for an eventual advance against Japan itself. The United States plan had little basis in reality. With the forces then available no adequate plan of defense was possible. The loss of relatively antiquated battleships at Pearl Harbor did not substantially reduce the actual combat capabilities of our Navy at that time as opposed to the Japanese Navy with its superiority in aircraft carriers and battle line speed. To have implemented an adequate plan in December 1941 would have required better intelligence regarding Japanese intentions and capabilities, an earlier understanding of the predominant and indispensable role of air strength and full public support for the necessary appropriations, well before the actual outbreak of war.

As it developed, all that we could do prior to May 1942, apart from the resistance of our isolated forces in the Philippines and sporadic carrier and land-based air raids, was to build up our strength in Australia and the islands lying between Pearl Harbor and Australia, while bringing to fruition our training and production programs.

TURNING THE TIDE

United States preparations were still inadequate when it became evident that the Japanese intended to advance south from the Bismarck Archipelago, and thus threaten our communications with Australia. It was decided nevertheless

to attempt to hold Port Moresby and a line north of Espiritu Santo and the Fiji Islands. Exceptional intelligence gave us advance information that a group of transports, protected by the Japanese carrier Shoho and by a covering force including two other carriers, was on its way to occupy Port Moresby in May 1942. This information enabled us to concentrate at the appropriate point two of our four carriers then available in the Pacific (one had come to the Pacific from the Atlantic, but two were returning from the Doolittle raid on Tokyo), and to sink the Shoho by torpedo-plane and dive-bomber attack. In the ensuing air engagement with the covering force, we damaged one of the Japanese carriers in that force, but lost the *Lexington*. The Japanese force had two carriers left to our one, but their air groups had been badly depleted. The transports turned back from Port Moresby to return to Rabaul and, for the first time, the Japanese advance had been checked. The combat in this Battle of the Coral Sea was entirely carrier air action.

Similar intelligence provided advance information as to the Japanese move toward Midway in June. In this case, the transports were supported by an advance striking force, including the most powerful surface forces yet assembled in the war and four of Japan's remaining eight operational carriers. An additional Japanese carrier was in a supporting force farther to the north. Again only weaker forces were available to the United States; three carriers, the *Enterprise*, *Yorktown*, and *Hornet*, the only ones available for combat action in the Pacific at that time, were rushed to the attack. Our planes located the Japanese fleet and sank three of the enemy carriers, and so damaged the fourth that she subsequently fell an easy prey to a United States submarine. Deprived of its carriers the Japanese Fleet was forced to retire despite its preponderance in heavy ship strength. Survey interrogations of surviving officers from the Japanese carriers indicate that they were sunk by carrier-based dive bombers. Two-thirds of the pilots on the Japanese carriers sunk were rescued by Japanese destroyers. Some of the Japanese carrier-based planes discovered our carriers and succeeded in damaging the *Yorktown* so seriously that she went dead in the water and was sunk by a Japanese submarine. Except for the finishing off of stragglers by submarines, the combat in this engagement was entirely air action.

, was maintained by desperate
and irregular reenforcement,

Immediately after Midway, the Japanese had 4 carriers fit for action, shortly to be joined by a fifth; but of these only 1 was large. In addition, they had 6 carriers under repair or construction. The United States had 3 large carriers operational in the Pacific and 13 carriers, and 15 escort carriers, either being readied for operation, or under construction. The Japanese Navy, thereafter, was hobbled by its weakness in the air, and could engage our forces only at night or under cover of land-based air until that air strength was rebuilt. A balance of naval air power in the Pacific, and as a consequence a balance of naval power as a whole, was thus achieved at Midway.

The scene of intense conflict shifted back to the islands south of Rabaul, the seas surrounding them, and the air over both. The Japanese had determined to renew their efforts to capture Port Moresby, if necessary by the overland route from the northern shore of New Guinea, and were constructing air fields in the Solomons. The United States Joint Chiefs of Staff ordered a two-pronged attack; one directed toward northern New Guinea from Port Moresby, the other up the chain of the Solomon Islands beginning with Guadalcanal; both with the final objective of capturing Rabaul. General MacArthur and Admiral Ghormley considered the forces available to them inadequate, but, in view of the importance of maintaining the line of communication with Australia, they were ordered to go ahead with what they had. A test of the Japanese perimeter thereby developed earlier than the Japanese had expected.

While the Southwest Pacific command was building air fields in northern Australia, Port Moresby and Milne Bay, the Japanese landed, on 21 July 1942, at Buna on the north coast of New Guinea opposite Port Moresby and infiltrated over the Owen Stanley Range. Their lines of communications were cut by air attacks, their advance columns strafed and their attack held and pushed back by ground forces, in part supplied by air. The Japanese testify that they were unable to reinforce this attack to the extent they had planned because of developments at Guadalcanal.

On 7 August 1942, a surprise landing was made on Guadalcanal. Three United States carriers gave initial air support and the Marines who landed quickly captured the air field (later named Henderson Field) which was under construction by the Japanese. Interrogation of the senior

Japanese commanders involved in the Solomons campaign indicates that they originally misjudged the strength of our attack and sent in only one reinforcement battalion of 500 men on fast destroyers from Truk. After this battalion was virtually destroyed, they sent in 5 more which again were not quite sufficient. Finally, they attempted to send in whole divisions. Thirty thousand troops were landed but, by that time, it was too late. Local control of the air provided by planes based on Henderson Field made it possible, but barely possible, to defend our unloading supply ships in the daytime, and made it impossible for the Japanese to land, except at night and then under hazardous and unsatisfactory conditions. The efforts of the Japanese to run in reinforcements at night, and at times to shell our shore installations, resulted in a series of night naval surface engagements which caused heavy losses to both sides. Our air strength was initially limited and at one time was reduced by enemy naval bombardment to only 5 operational airplanes. The Japanese constructed a chain of air fields between Guadalcanal and Rabaul, and attempted to raid our ships and installations. In the air actions, however, they suffered increasingly heavy losses, not merely in numbers, but also in proportion to United States losses. The Japanese paint a vivid picture of the intolerable position in which inability to achieve air control placed them. General Miyazaki testified that only 20 percent of the supplies dispatched from Rabaul to Guadalcanal ever reached there. As a result, the 30,000 troops they eventually landed on Guadalcanal lacked heavy equipment, adequate ammunition and even enough food, and were subjected to continuous harassment from the air. Approximately 10,000 were killed, 10,000 starved to death, and the remaining 10,000 were evacuated in February 1943, in a greatly weakened condition.

By the end of 1942, the most serious of the Japanese attempts to drive us off Guadalcanal had been thrown back and Allied operations to capture the Buna area were drawing to a close. We were securely established in these critical areas and had gradually built up local superiority in all arms, air, ground and sea. Our losses had been heavy. The Japanese, however, had suffered a crucial strategic defeat. Their advance had been stopped, their strategic plan fatally upset, many of their best pilots lost, and Allied forces firmly installed in

positions in the Solomons and New Guinea, which threatened the anchor of their perimeter at Rabaul. In opposing this threat, the Japanese committed in piecemeal fashion and lost all of their fully trained Navy air units, including those rescued at Midway, and a portion of their best Army air units. The Japanese never fully recovered from this disaster, the effects of which influenced all subsequent campaigns. For the first time, the few Japanese who had all the facts at their disposal appreciated the seriousness of the situation. Greatly expanded programs for the training of pilots and the production of aircraft, radar and communications equipment, antiaircraft guns and ammunition, cargo vessels and tankers, were drawn up, but time was required to implement them.

The initiative had passed to the United States.

FACTORS DETERMINING THE NATURE OF THE SUCCEEDING CAMPAIGN

After the engagements of 1942, certain basic lessons of combat in the Pacific theater had been learned. It appeared that the widely spread Japanese positions could be bypassed or captured, provided that air superiority in the necessary areas was achieved, and provided the required naval support, adequate assault craft, properly trained troops, and full logistics were available. Major preparations were required before decisive advances could be undertaken. In the meantime, however, unremitting pressure could be kept on the Japanese.

Due to the geography of the Empire, the Japanese ground forces depended for their effectiveness upon overseas support in all areas except the main home islands, and even there, overseas imports of raw materials were required. In China, Korea, and Manchuria, an overwater lift to the mainland was involved, and shipping was employed in the supply of troops in Malaya, Burma, and continental regions of the southwest. The islands of the eastern perimeter were completely dependent on supply by sea. Deployed as the Japanese ground forces were on detached land masses, dependent on inadequate shipping, their defeat was necessary only at points of United States choosing. The bulk of them could be bypassed.

The Japanese Navy, which included two 64,000-ton battleships of great fire-power and speed, had lost both operational freedom and striking power

due to its limited carrier-based air strength. By late 1943, the United States had available sufficient carriers for clear-cut superiority in the air, and had added to the fleet sufficient modern heavy ships to offer reasonable protection against the Japanese surface strength were it to be committed under bad weather or other conditions limiting the degree to which our superiority in the air could be brought to bear. The ability to destroy the Japanese surface forces, if they were committed, was essential. Furthermore, their destruction would increase the freedom and ease of our further advances.

The limitations imposed by geography and the range of Japanese land-based planes made it impossible for the Japanese to achieve sufficient mobility of their land-based air forces to concentrate their full air strength against us at any crucial point, prior to the invasion of the Philippines and Okinawa. Most of the island atolls were too small to support the necessary air fields, and in New Guinea, the Solomons and the Marianas, logistic, air field construction and ferrying problems made such concentration impossible. Even within the limits so imposed, poor Japanese staff work and tactics resulted in piecemeal employment of their available air strength. Over and above these weaknesses, Japanese aircraft production, pilot training and maintenance were so far behind our own that it was evident that general air superiority over the Japanese could be achieved. This objective received first priority.

The Japanese shipping target was immediately available. In the first year of the war, submarines, capable of long-range offensive action inside the Japanese perimeter, sank more than 10 percent and air planes 4 percent of the merchant ship tonnage which Japan possessed at the start of the war. The strangulation of Japanese overwater movement, thus begun, could be continued both by the submarine and by attack from the air.

Japanese industry and her home population would not be within effective striking distance of United States long-range bombers until bases within 1,500 nautical miles of Japan could be secured.

An advance to strategic positions across the Pacific would give us bases from which to complete the interdiction of Japan's overwater shipping, to mount large scale air attacks against the Japanese home islands, and to prepare for an invasion of the home islands themselves.

THE ADVANCE ACROSS THE PACIFIC

Such was the situation when the United States began its widespread offensive. While major preparations were still in progress, and the heavy attrition of the Solomons and eastern New Guinea campaign was chewing up Japan's best air groups and depleting her shipping and supplies, the first long-range moves in the advance across the Pacific were undertaken. These began unostentatiously with the assault against Attu, on the northern flank of the Japanese defense perimeter in May 1943. On the southern flank, the offensive continued with an advance to Munda in June, to Salamaua, Lae, and Finschafen on New Guinea in September, and Bougainville in November 1943. In the Central Pacific it began with the assault on the Gilbert Islands in November 1943.

Thereafter, the amphibious advance toward Japan continued over two routes. One was up the north coast of New Guinea to the Philippines, the other across the Central Pacific through the Marshalls to the Marianas and Palau and then subsequently on to Iwo Jima and Okinawa. Basically, the advance was for the purpose of projecting United States power to points which cut Japan's supply lines to the south and were within striking range of the Japanese home islands. Objectives were seized for one or more of four purposes: To provide forward air fields so that shore-based aircraft might maintain and project forward United States control of the air; to furnish advance bases for the fleet; to secure land areas for the staging of troops in succeeding advances; and, in the case of the Marianas, to provide bases for long-range air attacks on the Japanese home islands.

In the New Guinea area it continued to be possible to choose objectives for our advance where the enemy was weak, to seal off these objectives from enemy reinforcement and cover advances to them with land-based air, and, in certain instances, to supply the operation entirely by air. Marilinan, Nadzab and other inland bases on New Guinea, which eventually had complements as large as 25,000 men, were occupied, supplied and later moved forward entirely by air. The range of these advances was limited to the combat radius of fighter aircraft.

For long-range amphibious advances against strongly defended positions a typical pattern developed. Japanese bases flanking the United

States objective were smothered by a concentration of air power. Such bases as were within reach were hammered by shore-based air. Carrier-based air and available shore-based air softened the area to be occupied, and as the amphibious force moved up, fast carriers advancing beyond the objective struck swift blows at all positions which could threaten the objective area. With close air support from both escort and fast carriers and a concentration of gunfire from combatant ships of the support force, an amphibious assault over the beaches was made. The objective was secured under air support and cover from the carriers, which were not withdrawn until air fields ashore could be prepared and activated.

The amphibious steps along the two principal lines of advance toward Japan were well timed and mutually supporting, even though concentration on one line might have been more rapid. The losses inflicted at Rabaul, primarily by land-based planes from the Solomons and New Guinea, forced the Japanese to the decision not to support their garrisons in the Gilberts, were they to be attacked. The Central Pacific advance into the Gilbert and Marshall Islands in late 1943 and early 1944, and the threat of a fast carrier task force strike against Truk, which eventuated in February 1944, cleared the Japanese Fleet from the New Guinea flank and assisted the move into the Admiralties in March 1944 and the long step up the coast of New Guinea to Hollandia in April 1944, which was followed by a further advance to Wakde and Biak in May 1944. When the Japanese attempted reinforcement of northern New Guinea, the Central Pacific advance into the Marianas in June 1944, forced the abandonment of the operation. The Japanese committed their carriers in the defense of the Marianas, and lost in the Battle of the Philippines Sea practically all their carrier-based air groups sufficiently trained for combat, as well as three carriers sunk. Noemfoor was taken while the Japanese were preoccupied in the Marianas. Landings on Morotai were timed with those in the Palau.

While the landings in the Palau were in progress, the fast carrier task force struck Japanese aircraft, air fields and shipping in the Philippines. Preliminary to the Leyte operation, the fast carrier task force with a concentration of more than 1,000 planes attacked Okinawa, Formosa and the Philippines, exacting a large toll of Japanese air power. B-29 strikes from China against air in-

stallations on Formosa supported this operation. The landing at Leyte Gulf in the Philippines was correctly assessed by the Japanese as their last opportunity, short of a defense of the Japanese home islands, to throw in all their available forces to check the United States advance in a decisive engagement.

Three days after the landing at Leyte they committed their entire fleet in a three-pronged attack. The plan contemplated that a carrier force advancing from the north would draw off our main strength, while heavy surface forces approaching through Surigao and San Bernardino Straits and covered by Japanese Army and Navy planes from air fields in the Philippines would destroy our transports and supporting strength off the landing beach. The Japanese strategy succeeded in drawing off our main strength to the north. The southern Japanese force was destroyed in a night surface engagement in Surigao Straits. Four carriers in the northern force were sunk off Luzon. Although one of its super-battleships had been sunk by torpedo plane attack, the central force penetrated close to our transports still possessed of overwhelming surface strength. The Japanese commander of the central force testified to the Survey that lack of expected land-based air support and air reconnaissance, ~~uncertainty as to the forces available to us in the area~~, and worry as to his fuel reserves induced him to withdraw. As a result of this decision to retire, the Japanese failed to secure the objective for which catastrophic losses had been risked and suffered by the other two Japanese forces.

In the ensuing actions in the Philippines, the Japanese lost all the troops and supplies deployed there, plus three and one-half divisions sent in from China and Manchuria. In the Philippines campaign as a whole they committed and lost 9,000 planes. On 1 March 1945, the Japanese decided to send no further supplies to their ground forces outside of the home islands. Except for delaying actions they had been forced to concentrate solely on defense against invasion.

While the liberation of the Philippines was being completed, the Central Pacific forces made the difficult moves into Iwo Jima and Okinawa.

CHINA-BURMA-INDIA

The Allied strategic plan contemplated that the actual defeat of Japan would be accomplished by

fear of further losses
from air attack

operations in the Pacific. In the meantime, however, it was essential to defend India and to assist China. We could not afford to make substantial forces available. Our contribution in the China-Burma-India theater was almost entirely air and logistic support. The geography of the theater was such that overland transportation was virtually impossible beyond the Indian bases. As a consequence, the air in the China-Burma-India theater was called upon, not only to give protection against and to fight down enemy air and disrupt Japanese shipping and rail transportation, but also to transport the men and supplies for all forces and provide much of the fire power even in ground operations.

Full superiority over Japanese air forces was gradually attained. British ground forces at Imphal which had been surrounded by an attacking Japanese force were supplied by Allied air. The Japanese force was in turn isolated by air attack and destroyed. The troops that liberated Burma were moved, supplied, and supported by air. Japanese logistics in Burma and China were disrupted. China was kept in the war.

Over 1,180,000 tons of supplies and equipment and 1,380,000 troops were transported by air. The air movement over the "hump" between India and China attained a peak rate of 71,000 tons in 1 month.

In the fall of 1943 it was decided to attack Japanese industrial targets in Manchuria and Kyushu with B-29s flying from advanced bases in China. When this decision was reached, Guam, Saipan and Tinian had not yet been captured, and no other bases were available sufficiently close for direct strikes at the Japanese "Inner Zone" industries. The principal bottleneck in air operation in China was the transportation from India by air of the necessary supplies, most of which were allocated to supplying Chinese ground forces. As a result, the B-29s had sufficient supplies for only a small number of strikes per month. Data secured by the Survey in Japan established that these strikes caused more severe damage to the Manchurian steel plants selected as targets than assessment of aerial photography had revealed. With the benefit of hindsight, however, it appears that the overall results achieved did not warrant the diversion of effort entailed and that the aviation gasoline and supplies used by the B-29s might have been more profitably allocated to an expansion of the

tactical and antishipping operations of the Fourteenth Air Force in China. The necessary training and combat experience with B-29s provided by this operation might have been secured through attacks on "Outer Zone" targets, from bases more easily supplied. In November 1944, long-range bomber attacks from Guam, Saipan and Tinian were initiated. The B-29s based in China were transferred to these bases in April 1945.

By March 1945, prior to heavy direct air attack on the Japanese home islands, the Japanese air forces had been reduced to Kamikaze forces, her fleet had been sunk or immobilized, her merchant marine decimated, large portions of her ground forces isolated, and the strangulation of her economy well begun. What happened to each of these segments of Japan's vanishing war potential is analyzed in the following sections.

ELIMINATION OF JAPANESE CONVENTIONAL AIR POWER

Japanese production of aircraft of all types rose from an average of 642 planes per month during the first 9 months of the war to a peak of 2,572 planes per month in September 1944. The rise was particularly great during 1943, after the Japanese had learned the lessons of the 1942 campaigns. Aggregate production during the war was 65,300 planes.

Japanese army and navy plane losses from all causes, both combat and noncombat, rose from an average rate of some 500 planes per month in the early months of the war to over 2,000 per month in the latter months of 1944. Aggregate losses during the course of the war were of the order of magnitude of 50,000 planes, of which something less than 40 percent were combat losses, and something over 60 percent were training, ferrying, and other noncombat losses.

The Japanese were thus able to increase the numerical strength of their air forces in planes, in almost every month of the war. Numerical strength increased from 2,625 tactical planes at the outbreak of the war to 5,000 tactical planes, plus 5,400 Kamikaze planes, at the time of surrender.

Aggregate flying personnel increased from approximately 12,000 at the outbreak of the war to over 35,000 at the time of surrender.

United States aircraft production and pilot training exceeded the Japanese totals by wide margins, but only a portion of this strength could

be deployed to the Pacific. United States first line strength in the Pacific west of Pearl Harbor increased from some 200 planes in 1941 to 11,000 planes in August 1945. It was not until late 1943 that we attained numerical superiority over the Japanese air forces in the field. Even in 1942, however, the relatively few United States air units in the Pacific were able to inflict greater losses than they sustained on the numerically superior Japanese. Aggregate United States plane losses during the course of the Pacific war, not including training losses in the United States, were approximately 27,000 planes. Of these losses 8,700 were on combat missions; the remainder were training, ferrying and other noncombat losses. Of the combat losses over 80 percent were to antiaircraft fire.

As previously stated, Japanese pilots at the outbreak of the war were well trained. The average Army pilot had some 500 hours before entering combat and Navy pilots 650 hours. These experienced pilots were largely expended during the bitter campaigns of the opening year and a half of the war. The Japanese paid far less attention than we did to the protection, husbanding and replacement of their trained pilots, and were seriously hampered in their training program by a growing shortage of aviation gasoline. Average flying experience fell off throughout the war, and was just over 100 hours, as contrasted to 600 hours for United States pilots, at the time of surrender. Inadequately trained pilots were no match for the skilled pilots developed by the United States.

At the time of the initial Japanese attack, Japanese fighter planes, although less sturdily built, more vulnerable and weaker in fire power than the United States fighters, had certain flight characteristics superior to those of United States fighters then available in the Pacific. The Japanese improved the quality of their planes during the war, greatly increased the power of their aircraft engines, ultimately exceeded United States fighters in fire power and had first-class aircraft in the design and experimental stage at the end of the war. They lacked, however, the widespread technical and industrial skill to match the United States in quantity production of reliable planes with increased range, performance and durability. After the initial campaigns, the United States always enjoyed superiority in the over-all performance of its planes.

By American standards, the Japanese never

fully appreciated the importance of adequate maintenance, logistic support, communications and control, and air fields and bases adequately prepared to handle large numbers of planes. As a result, they were unable to concentrate any large percentage of their air strength at any one time or place. Neither did they appear to have the ability to control large formations in the air with any degree of efficiency.

Local air control and its tactical exploitation the Japanese understood and achieved in their early offensives.

But along with all other military powers prior to the war, the Japanese had failed fully to appreciate the strategic revolution brought about by the increased capabilities of air power. The ability to achieve general and continuing control of the air was not envisaged as a requirement in their basic war strategy, as was the planned destruction of the United States Fleet. Had this basic requirement been well understood it is difficult to conceive that they would have undertaken a war of limited objectives in the first place. Once started on a strategic plan which did not provide the means to assure continuing air control, there was no way in which they could revise their strategy to reverse the growing predominance in the air of a basically stronger opponent who came to understand this requirement and whose war was being fought accordingly.

CONVERSION OF JAPANESE AIR FORCES TO KAMIKAZE FORCES

By the summer of 1944, it had become evident to the Japanese air commanders that there was no way in which they could equal the United States air arms at any point. Their losses were catastrophic, while the results which they were achieving were negligible. The one and only asset which they still possessed was the willingness of their pilots to meet certain death. Under these circumstances, they developed the Kamikaze technique. A pilot who was prepared to fly his plane directly into a ship would require but little skill to hit his target, provided he got through the intervening screen of enemy fighters and antiaircraft fire. If sufficient Japanese planes attacked simultaneously, it would be impossible to prevent a certain proportion from getting through. Even though losses would be 100 percent of the planes

and pilots thus committed, results, instead of being negligible, might be sufficient to cause damage beyond that which we would be willing to endure.

From October, 1944, to the end of the Okinawa campaign, the Japanese flew 2,550 Kamikaze missions, of which 475, or 18.6 percent were effective in securing hits or damaging near misses. Warships of all types were damaged, including 12 aircraft carriers, 15 battleships, and 16 light and escort carriers. However, no ship larger than an escort carrier was sunk. Approximately 45 vessels were sunk, the bulk of which were destroyers. The Japanese were misled by their own inflated claims of heavy ships sunk, and ignored the advice of their technicians that a heavier explosive head was required to sink large ships. To the United States the losses actually sustained were serious, and caused great concern. Two thousand B-29 sorties were diverted from direct attacks on Japanese cities and industries to striking Kamikaze air fields in Kyushu. Had the Japanese been able to sustain an attack of greater power and concentration they might have been able to cause us to withdraw or to revise our strategic plans.

At the time of surrender, the Japanese had more than 9,000 planes in the home islands available for Kamikaze attack, and more than 5,000 had already been specially fitted for suicide attack to resist our planned invasion.

DESTRUCTION OF THE JAPANESE FLEET

As stated earlier in this report Japan started the war with 10 carriers. Six were sunk during the engagements of 1942. The Japanese during the course of the war constructed or converted from other types of ships a total of 17 additional carriers including 5 escort carriers; of the conversions one was made on a Yamato-class battleship hull and two, carriers only in part, were the result of removing the after turrets of battleships and installing small hangars and launching decks. Due to the loss of their trained carrier air groups in 1942-43 and the time required to train new ones, the Japanese did not commit their carriers again until 1944. In the engagements of that year the Japanese lost 7 carriers without themselves securing appreciable results. Seven more were lost in home waters to submarine or air attack. All Japanese carriers sunk were lost either to our carrier-based aircraft or to submarines with the exception of one which was finished off by sur-

face vessels after it had been mortally damaged by carrier airplanes.

The Japanese had two *Yamato*-class battleships, each of 64,000 tons, armed with 18-inch guns and minutely compartmented, which were more powerful than any United States battleship. One was sunk in the Sibuyan Sea, the other south of Kyushu, both by carrier torpedo-planes.

Japan began the war with 381 warships aggregating approximately 1,271,000 tons. An additional 816 combat ships totaling 1,048,000 tons were constructed during the war. Five hundred and forty-nine ships of all types and sizes, totaling 1,744,000 tons were sunk. Approximately 1,300,000 tons of Japanese warships in the carrier, battleship, cruiser and destroyer categories were included in the aggregate tonnage sunk. Of this total roughly 625,000 tons were sunk by Navy and Marine aircraft, 375,000 tons by submarines, 183,000 tons by surface vessels, 55,000 tons by Army aircraft, and 65,000 tons by various agents. Only 196,000 tons in these categories remained afloat at the end of the war. The tonnage sunk by surface ships was principally in night actions. A shortage of Japanese destroyers after 1943 and inadequate Japanese air antisubmarine measures contributed to the successes of United States submarines against the Japanese fleet.

After the liberation of the Philippines and the capture of Okinawa, oil imports into Japan were completely cut off; fuel oil stocks had been exhausted, and the few remaining Japanese warships, being without fuel, were decommissioned or were covered with camouflage and used only as antiaircraft platforms. Except for its shore-based Kamikaze airforce and surface and undersea craft adapted for anti-invasion suicide attack, the Japanese Navy had ceased to exist.

DESTRUCTION OF THE JAPANESE MERCHANT FLEET

Japan's merchant shipping fleet, was not only a key link in the logistical support of her armed forces in the field, but also a vital link in her economic structure. It was the sole element of this basic structure which was vulnerable to direct attack throughout a major portion of the war.

Japan entered the war with some 6,000,000 tons of merchant shipping of over 500 tons gross weight. During the war an additional 4,100,000

tons were constructed, captured or requisitioned. Sufficient information was secured by the Survey in Japan concerning this 10,100,000 tons to tabulate ship by ship, (a) the name and tonnage, (b) the date, location, and agent of sinking or damage, and (c) the present condition and location of such ships as survived. The sources from which evidence was obtained were in some respects conflicting. Where possible these conflicts have been resolved. The Joint Army and Navy Assessment Committee has tentatively arrived at similar results and is continuing its efforts further to refine the evidence. The Survey believes that the figures included in the following breakdown will not differ significantly from the final evaluation of the Joint Army and Navy Assessment Committee.

Eight million nine hundred thousand tons of this shipping were sunk or so seriously damaged as to be out of action at the end of the war. Fifty-four and seven-tenths percent of this total was attributable to submarines, 16.3 percent to carrier-based planes, 10.2 percent to Army land-based planes and 4.3 percent to Navy and Marine land-based planes, 9.3 percent to mines (largely dropped by B-29s), less than 1 percent to surface gunfire, and the balance of 4 percent to marine accidents.

Due to their ability to penetrate deeply into enemy-controlled waters, submarines accounted for approximately 60 percent of sinkings up until the final months of the war. During 1944, carrier task forces made deep sweeps which accounted for large numbers of ships. After April, 1945, when Japanese shipping was restricted to the Korean and Manchurian runs and to shallow inland waters, mines dropped by B-29s in Japanese harbors and inland waterways accounted for 50 percent of all ships sunk or damaged. In isolating areas of combat from ship-borne reinforcements land-based aircraft also sank large numbers of barges and vessels smaller than 500 tons gross weight, not included in the tabulation prepared by the Survey.

In the Survey's opinion those air units which had anti-shipping attacks as their prime mission and employed the required specialized techniques, equipment and training achieved against ships the best results for the effort expended.

The Japanese originally allocated two-thirds of their shipping fleet to the logistic support of their military forces in the field. They expected that

after their original advance had been completed they would be able to return increasing numbers of ships to the movement of raw materials for their basic economy. After the beginning of the Guadalcanal campaign, however, they were kept under such constant and unexpected military pressure that the contemplated returns after that date were never possible.

Up to the end of 1942, ship sinkings exceeded new acquisitions by a small margin. Thereafter, the aggregate tonnage sunk increased far more rapidly than could be matched by the expansion of the Japanese shipbuilding program. The size of the usable fleet thus declined continuously and at the end of the war amounted to little more than 10 percent of its original tonnage. The Japanese belatedly attempted to build up a convoy system, to re-route freight movements to rail lines, and to abandon more distant sources of supply, but these measures acted only as palliatives and not as cures. Furthermore, convoying and re-routing decreased the freight moved per ship by a factor amounting to 43 percent in the closing months of the war. In 1944 tanker losses became particularly heavy and were thereafter the first concern of the Japanese shipping authorities.

The basic economic consequences of ship sinking will be discussed in a later section. From the standpoint of the Japanese armed forces in the field it will be noted that 17 percent of army supplies shipped from Japan were sunk in 1943, 30 percent in 1944, and 50 percent in 1945. A shortage of fleet tankers was a continuing limitation on the mobility of the Japanese fleet and contributed to its defeat in the two crucial battles of the Philippine Sea. Inadequate logistic support, due in large part to lack of shipping, was one of the principal handicaps of the Japanese air forces.

Attacks by submarines, long-range search and attack planes, mines, and carrier and land-based planes were mutually supporting and complicated the Japanese defenses. Long-range air search found targets for the submarines; convoying which offered some protection against submarines increased the vulnerability to air attack; ships driven into congested harbors in fear of submarines were easy prey for carrier strikes; and mines helped to drive ships out of shallow water into waters where submarines could operate. Had we constructed more submarines, earlier concentrated on tankers and more fully coordinated long-range

air search and attack missions with submarine operations, the ship sinking program might have been even more effective.

DESTRUCTION OR ISOLATION OF JAPANESE GROUND FORCES

The Japanese built up their army ground forces from a strength of approximately 1,700,000 at the outbreak of war, to a peak strength of approximately 5,000,000. Japanese army medical records indicate that the aggregate number deployed in the Solomons, New Guinea, Marshalls, Gilberts, Carolines, Marianas, Philippines, Okinawa, Iwo Jima, and the Aleutians was approximately 668,000, of whom 316,000 were killed in action; some 220,000 were deployed in Burma, of whom 40,000 were killed; and 1,100,000 were deployed in China, of whom 103,000 were killed. Most of the remainder were in Manchuria, Korea, or the home islands, and did not actively participate in the decisive campaigns of the war.

The strategy of our advance and the limitations imposed on Japanese overwater transportation became such that the Japanese could concentrate only a small portion of their available Army ground forces strength at any of the critical island positions which we determined to capture. Japanese soldiers were unique in their willingness to face death and endure hardships. At every point where our Army or Marine forces engaged the Japanese on the ground after 1942, we enjoyed full air superiority. In every instance, except Ormoc in the Leyte campaign, we had eliminated Japanese ability to reinforce the critical area with either men or supplies. At Ormoc the Japanese were able to land 30,000 troops, but these reinforcements arrived piecemeal over too long a period of time to be effective and many of the transports were sunk prior to unloading heavy equipment. In every instance where the Japanese had prepared defenses in a landing area these had been softened up by aerial bombardment and usually by naval shelling as well. It often proved impossible, however, to destroy more than a small percentage of the defending Japanese soldiers in preliminary softening up operations of even the greatest intensity. The Japanese were dug in, in tunnels, trenches and caves which were hard to find and often impossible to destroy, either by bombing or by naval shelling. Most of their fixed artillery positions were eliminated, but even some of these survived. The

weight of fire on the immediate invasion beaches was generally such that the Japanese retired a short distance inland, but once we advanced beyond the beaches, it became necessary to destroy the remaining Japanese in costly close-range fighting. It was demonstrated, however, that Japanese resistance was effectively weakened and our casualties lighter when the appropriate weapons were employed with sufficient weight and accuracy in both preliminary softening up operations and subsequent close support.

A Japanese estimate indicates that in the southern regions, approximately 25 percent of their combat deaths resulted from aerial bombardment, 58 percent from small arms fire, 15 percent from artillery, and the remaining 2 percent from other causes.

In those places where it was essential to eliminate Japanese ground resistance in close-range fighting, great precision had to be developed in air-support operations in order to be certain not to hit our own troops, and to assure hits on the small targets which the critical Japanese positions presented. This required highly specialized training and the closest coordination between the ground and air forces through an intricate system of ground and air observers and unified control by ground-ship-air radio communication. In the Pacific war this system was continuously improved by the Navy and Marines in connection with succeeding amphibious operations against strongly defended positions and reached a high degree of effectiveness. In the Philippines campaign, the Army air forces employed comparable techniques, and General Yamashita has testified to his feeling of complete helplessness when confronted with this type of opposition.

In the Southwest Pacific, it often proved possible to effect landings at lightly held positions, and thus bypass large bodies of enemy ground forces. In the Central Pacific, many of the islands the Japanese expected us to attack were bypassed, and the garrisons left to wither and die. Survey examination of the bypassed islands in the Pacific and interrogation of the Japanese survivors confirmed their intolerable situation. Their planes and ground installations were destroyed by air attack. Cut off from any supplies or reinforcements, except occasionally by submarine, their food ran out. On certain of the islands, Japanese actually ate Japanese. It appears, however, that

our air attacks on these bypassed positions were often continued longer and in greater weight than was reasonably required or profitable.

THE JAPANESE ECONOMY PRIOR TO SUSTAINED DIRECT AIR ATTACK

The orientation of the Japanese economy toward war began in 1928, and continued with increasing emphasis during the Manchurian and Chinese campaigns. By 1940, total production had arisen by more than 75 percent; heavy industrial production by almost 500 percent; and 17 percent of Japan's total output was being devoted to direct war purposes and expansion of her munition industries, as against 2.6 percent at that time in the United States. Construction of industrial facilities in these years assumed—for the Japanese conditions—gigantic proportions. Her aircraft, aluminum, machine tool, automotive, and tank industries were erected from almost nothing during this period.

This industrial expansion was based and depended on the availability of raw materials. Great efforts were devoted to the increase of raw material output in the home islands. In some respects, major results were achieved. Coal production in Japan rose from 28,000,000 tons in 1931 to 55,600,000 tons in 1941. Domestic iron mining made considerable progress. Nevertheless, no country could have been farther from self-sufficiency, with respect to raw materials, than Japan. The development of basic material sources on the continent of Asia constituted almost the central issue of Japan's economic policy during this period.

Although progress in Manchuria and China helped significantly to alleviate Japan's raw material shortages in coking coal, iron ore, salt and foods, insufficiency of raw materials continued to be the most important limiting factor on Japanese industrial output. Negligible quantities of oil and no bauxite sources existed within Japan's "Inner Zone." Output of aluminum ingots had risen from 19 tons in 1933 to 71,740 in 1941, 90 percent of which was produced from bauxite imported from the Dutch East Indies. Plans to develop a synthetic oil industry failed to yield significant results and Japan was almost wholly dependent on oil imports from the United States or the Dutch East Indies. A similar dependence on imports existed for rubber, ferro-alloys such as manganese,

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chrome, nickel, cobalt and tungsten, and for non-ferrous metals such as tin, lead, and mercury.

Pending seizure and economic exploitation of the oil and bauxite resources of the southern area, stock piling of these vital materials was a necessity. By the end of 1941, bauxite stocks of 250,000 tons, constituting a 7 months' supply, and 43,000,000 barrels of oil and oil products were stored in Japan.

Considering the economic performance of the decade, one cannot but be impressed by the intensity of the effort and the magnitude of the results. Nonetheless, Japan remained with an economy having approximately 10 percent of the potential of the United States economy. It was desperately vulnerable to attack on its shipping. Having a comparatively small, newly developed industry, it had to work without much cushion of under-utilized physical plant capacity. Having had little experience with mass production, the country had no opportunity to build up a large force of industrially and mechanically trained personnel. This meant shortages of skills, ingenuity and ability to improvise later on, when the economy was under the stresses and strains of large-scale warfare.

This economic potential could support a short war or a war of limited liabilities. The accumulated stocks of munitions, oil, planes and ships could be thrown into action and produce a devastating effect on unmobilized enemies. When this initial blow failed to result in peace, Japan, without significant help from Germany, was doomed. Its economy could not support a protracted campaign against an enemy even half as strong as the United States.

In addition, the success of the initial Japanese military operations delayed total economic mobilization until after the defeats of late 1942. Computed in constant prices, the gross national product rose from a level of 39.8 billion yen in the fiscal year beginning with April 1940, to only 41 billion yen in the fiscal year 1942. That this was due to an inadequate realization of requirements and inadequate planning, and not to the inherent limitations of the Japanese economy, is clear from the expansion that was secured after 1942. In the fiscal year 1943, the gross national product rose to 45.4 billion yen, and in 1944 to 50 billion yen.

The share of the gross national product devoted to direct war and munitions expenditures increased from 23 percent in 1941 to 31 percent in 1942, 42

percent in 1943 and 52 percent in 1944. In 1944, half of the remaining national product was accounted for by food. In 1943, however, the United States was devoting 45 percent of its vastly greater national product to direct war purposes. By the summer of 1944, the Japanese had exhausted the possibility of forcing a greater share of their economy into direct war activities. Their plants, railroad and mines were being, and had been for some time, under-maintained to a point where breakdowns were becoming more and more serious. The civilian population was underfed, was receiving practically no new clothing or miscellaneous civilian supplies, and was being worked to a degree of fatigue which was reflected in rising rates of absenteeism.

By 1944, Japan had increased ingot steel capacity to 225 percent of the 1937 capacity. A shortage of raw materials, however, which began with the United States embargo on scrap iron exports in July 1941 and was never overcome, prevented the operation of Japanese steel mills at anything approaching capacity. Japanese coal would not produce satisfactory metallurgical coke without the admixture of stronger continental coking coal; domestic iron ore was both limited in quantity and of lower grade than imported ores. The combination of limited quantities of high-grade imported raw materials and lower grade domestic materials held production of ingot steel in the home islands to 6,800,000 tons in 1941, to a peak of 7,800,000 tons in 1943, and caused it to decline to 5,900,000 tons in 1944. This compared with a 1937 production of 5,800,000 tons and a theoretical capacity, using high-grade materials, of 13,600,000 tons in 1944. By the middle of 1944, the increasing stringency of shipping and the interdiction of many of Japan's shipping routes had reduced coal and ore imports by two-thirds. Stockpiles of imported materials had already been heavily eaten into, and ingot steel production began to decline rapidly. In March 1945, imports of coal virtually ceased, and iron ore was cut off entirely, as the Japanese elected to devote their remaining shipping capacity to the hauling of vitally needed foodstuffs and salt. It is estimated by the Survey that, using only domestic raw materials, the Japanese steel industry could not have maintained a rate of production of ingot steel in excess of 1,500,000 tons per annum. By August 1945, the rate of output was still somewhat in excess of this

figure, but would soon have been reduced. The decline in Japan's steel production can be attributed to its dependence on shipping and the destruction of that shipping. Had this industry not been mortally wounded by shipping attack and had its destruction by bombing been called for, the effectiveness of the few strategic bombing attacks directed against the steel industry indicates that destruction of the principal plants by bombing or paralysis of the industry by disruption of railroad transportation would have been possible, but only at a later date.

The steel shortage constituted an over-all limitation on the war potential of the Japanese economy. Japanese planners were, however, able to secure very substantial increases in the production of those military products which the experiences of the war had demonstrated to be of outstanding importance. Aircraft production of all types, including training planes, was stepped up from 700 planes per month in the summer of 1942 to 2,572 planes in September 1944. Aircraft engine production was not only increased correspondingly in numbers, but average horsepower was doubled. Aircraft and antiaircraft gun and ammunition production was expanded tenfold. Radar and communications equipment was stepped up five-fold. The most important consumer of steel was the shipbuilding industry. The increasingly critical nature of Japan's shipping situation caused her to expand her naval and merchant shipbuilding programs to a point where 35 percent of all steel consumed was being used in that industry alone. Construction of merchant ships increased from approximately 238,000 tons in 1941, to 1,600,000 tons of steel ships and 254,000 tons of wooden ships in 1944. During 1942, warship deliveries included one battleship of 64,000 tons and six small carriers totalling 84,000 tons. In 1944, no battleships, but four aircraft carriers of 114,500 displacement tons and 141,800 tons of escort vessels and submarines were delivered. The increases in production of high-priority items involved the scaling down of steel availability for lower priority items, such as tanks, larger caliber guns and trucks, and the almost complete elimination of steel for civilian requirements, construction, or export.

During 1944, the effects of the net loss of shipping and slow-down in ship operations became such that by the end of the year it no longer was possible to protect even high-priority war produc-

tion by further shifting of allocations of scarce materials from items of lesser priority. In addition to steel, other basic elements of the economy were involved. Oil, although not as important as steel in its broad impact on the remainder of the economy, was of critical importance to Japan's military machine and to her merchant marine. Oil imports from the south began declining in August 1943, and had been eliminated by April 1945. Crude oil stocks were virtually exhausted; refinery operations had to be curtailed; and stocks of aviation gasoline fell to less than 1,500,000 barrels, a point so low as to require a drastic cut in the pilot-training program and even in combat air missions. Bauxite imports declined from 136,000 tons in the second quarter of 1944, to 30,000 tons in the third, and stockpiles were only 3,000 tons. Stockpiles and the time delay between the various stages of production cushioned for a time the inevitable effects of the blockade on finished munitions production, but by November 1944, the over-all level of Japanese war production had begun to turn down, including even the highest priority items, such as aircraft engines.

It is the opinion of the Survey that by August 1945, even without direct air attack on her cities and industries, the over-all level of Japanese war production would have declined below the peak levels of 1944 by 40 to 50 percent solely as a result of the interdiction of overseas imports.

By mid-1944 those Japanese in possession of the basic information saw with reasonable clarity the economic disaster which was inevitably descending on Japan. Furthermore, they were aware of the disastrous impact of long-range bombing on Germany, and, with the loss of the Marianas, could foresee a similar attack on Japan's industries and cities. Their influence, however, was not sufficient to overcome the influence of the Army which was confident of its ability to resist invasion.

THE AIR ATTACK AGAINST THE JAPANESE HOME ISLANDS

Basic United States strategy contemplated that the final decision in the Japanese war would be obtained by an invasion of the Japanese home islands. The long-range bombing offensive from the Marianas was initiated in November 1944, with that in mind as the primary objective. As in Europe prior to D-day, the principal measure of success set for strategic air action was the ex-

tent to which it would weaken enemy capability and will to resist our amphibious forces at the time of landings. This led, originally, to somewhat greater emphasis on the selection of targets such as aircraft factories, arsenals, electronics plants, oil refineries, and finished military goods, destruction of which could be expected to weaken the capabilities of the Japanese armed forces to resist at the Kyushu beachheads in November 1945, than on the disruption of the more basic elements of Japan's social, economic, and political fabric. Certain of the United States commanders and the representatives of the Survey who were called back from their investigations in Germany in early June 1945 for consultation stated their belief that, by the coordinated impact of blockade and direct air attack, Japan could be forced to surrender without invasion. The controlling opinion, however, was that any estimate of the effects of bombing on the Japanese social fabric and on the political decisions of those in control of Japan was bound to be so uncertain that target selection could safely be made only on the assumption that ground force invasion would be necessary to force capitulation.

With the benefit of hindsight, it appears that the twin objectives of surrender without invasion and reduction of Japan's capacity and will to resist an invasion, should the first not succeed, called for basically the same type of attack. Japan had been critically wounded by military defeats, destruction of the bulk of her merchant fleet, and almost complete blockade. The proper target, after an initial attack on aircraft engine plants, either to bring overwhelming pressure on her to surrender, or to reduce her capability of resisting invasion, was the basic economic and social fabric of the country. Disruption of her railroad and transportation system by daylight attacks, coupled with destruction of her cities by night and bad weather attacks, would have applied maximum pressure in support of either aim. This point of view was finally adopted. Although urban area attacks were initiated in force in March 1945, the railroad attack was just getting under way when the war ended.

The total tonnage of bombs dropped by Allied planes in the Pacific war was 656,400. Of this, 160,800 tons, or 24 percent, were dropped on the home islands of Japan. Navy aircraft accounted for 6,800 tons, Army aircraft other than B-29s for 7,000 tons, and the B-29s for 147,000 tons. By contrast, the total bomb tonnage in the European

theater was 2,700,000 tons of which 1,360,000 tons were dropped within Germany's own borders.

Approximately 800 tons of bombs were dropped by China-based B-29s on Japanese home island targets from June 1944 to January 1945. These raids were of insufficient weight and accuracy to produce significant results.

By the end of November 1944, 4 months after seizure of the islands, the first of the long-range bomber bases in the Marianas became operational. The number of planes originally available was small and opposition was significant. Losses on combat missions averaged 3.6 percent. The tonnage dropped prior to 9 March 1945 aggregated only 7,180 tons although increasing month by month. The planes bombed from approximately 30,000 feet and the percentage of bombs dropped which hit the target areas averaged less than 10 percent. Nevertheless, the effects of even the relatively small tonnage hitting the selected targets were substantial. During this period, attacks were directed almost exclusively against aircraft, primarily aircraft engine, targets. The principal aircraft engine plants were hit sufficiently heavily and persistently to convince the Japanese that these plants would inevitably be totally destroyed. The Japanese were thereby forced into a wholesale and hasty dispersal program. The continuing pressure of immediate military requirements for more and more planes during the campaigns in the Pacific had prevented any earlier moves to disperse. When dispersal could no longer be avoided, the necessary underground tunnels, dispersed buildings, and accessory facilities such as roads, railroad spurs and power connections were not ready. As a result the decline in aircraft engine production, which shortages in special steels requiring cobalt, nickel and chrome had initiated in mid-1944, became precipitous.

On 9 March 1945, a basic revision in the method of B-29 attack was instituted. It was decided to bomb the four principal Japanese cities at night from altitudes averaging 7,000 feet. Japanese weakness in night fighters and antiaircraft made this program feasible. Incendiaries were used instead of high-explosive bombs and the lower altitude permitted a substantial increase in bomb load per plane. One thousand six hundred and sixty-seven tons of bombs were dropped on Tokyo in the first attack. The chosen areas were saturated. Fifteen square miles of Tokyo's most densely pop-

ulated area were burned to the ground. The weight and intensity of this attack caught the Japanese by surprise. No subsequent urban area attack was equally destructive. Two days later, an attack of similar magnitude on Nagoya destroyed 2 square miles. In a period of 10 days starting 9 March, a total of 1,595 sorties delivered 9,373 tons of bombs against Tokyo, Nagoya, Osake, and Kobe destroying 31 square miles of those cities at a cost of 22 airplanes. The generally destructive effect of incendiary attacks against Japanese cities had been demonstrated.

Thereafter, urban area attacks alternated with visual and radar attacks against selected industrial or military targets. In April, an extensive program of sowing minefields in channels and harbors at night was added. In the aggregate, 104,000 tons of bombs were directed at 66 urban areas; 14,150 tons were directed at aircraft factories; 10,600 tons at oil refineries; 4,708 at arsenals; 3,500 tons at miscellaneous industrial targets; 8,115 tons at air fields and sea-plane bases in support of the Okinawa operation; and 12,054 mines were sown.

Bombing altitudes after 9 March 1945 were lower, in both day and night attacks. Japanese opposition was not effective even at the lower altitudes, and the percentage of losses to enemy action declined as the number of attacking planes increased. Bomb loads increased and operating losses declined in part due to less strain on engines at lower altitudes. Bombing accuracy increased substantially, and averaged 35 to 40 percent within 1,000 feet of the aiming point in daylight attacks from 20,000 feet or lower.

Monthly tonnage dropped increased from 13,800 tons in March to 42,700 tons in July, and, with the activation of the Eighth Air Force on Okinawa, would have continued to increase thereafter to a planned figure of 115,000 tons per month, had the war not come to an end.

Three-quarters of the 6,740 tons of bombs dropped by carrier planes on the Japanese home islands were directed against airfields, warships, and miscellaneous military targets, and one-quarter against merchant shipping and other economic targets. Most of the warships sunk in home ports had already been immobilized for lack of fuel. The accuracy of low-level carrier plane attack was high, being at least 50 percent hits within 250 feet of the aiming point. The attack against the Hakodate-Aomori rail ferries in July 1945 sank or

damaged all twelve of the ferries, 17 steel ships, and 149 smaller ships.

ECONOMIC EFFECTS OF AIR ATTACK AGAINST THE JAPANESE HOME ISLANDS

The physical destruction resulting from the air attack on Japan approximates that suffered by Germany, even though the tonnage of bombs dropped was far smaller. The attack was more concentrated in time, and the target areas were smaller and more vulnerable. Not only were the Japanese defenses overwhelmed, but Japan's will and capacity for reconstruction, dispersal, and passive defense were less than Germany's. In the aggregate some 40 percent of the built-up area of the 66 cities attacked was destroyed. Approximately 30 percent of the entire urban population of Japan lost their homes and many of their possessions. The physical destruction of industrial plants subjected to high-explosive attacks was similarly impressive. The larger bomb loads of the B-29s permitted higher densities of bombs per acre in the plant area, and on the average somewhat heavier bombs were used. The destruction was generally more complete than in Germany. Plants specifically attacked with high-explosive bombs were, however, limited in number.

The railroad system had not yet been subjected to substantial attack and remained in reasonably good operating condition at the time of surrender. Little damage was suffered which interfered with main line operations. Trains were running through Hiroshima 48 hours after the dropping of the atomic bomb on that city. Damage to local transport facilities, however, seriously disrupted the movement of supplies within and between cities, thereby hindering production, repair work and dispersal operations.

Japan's electric power system was properly rejected for specific attack because of the large number of small targets presented. Urban incendiary attacks destroyed the electric distribution systems in the burned-out areas simultaneously with the consumer load previously served by them. The hydro-electric generating plants and the transmission networks survived without substantial damage. Twenty-six urban steam-generating plants were damaged as an incident to other attacks, the aggregate loss of capacity being less than one-seventh of Japan's total generating capacity.

The urban area incendiary attacks eliminated

completely the residential and smaller commercial and industrial structures in the affected areas and a significant number of important plants, but a portion of the more substantially constructed office buildings and factories in those areas and the underground utilities survived. By 1944 the Japanese had almost eliminated home industry in their war economy. They still relied, however, on plants employing less than 250 workers for subcontracted parts and equipment. Many of these smaller plants were concentrated in Tokyo and accounted for 50 percent of the total industrial output of the city. Such plants suffered severe damage in urban incendiary attacks.

Four hundred and seventy thousand barrels of oil and oil products, 221,000 tons of foodstuffs and 2 billion square yards of textiles were destroyed by air attacks. Ninety-seven percent of Japan's stocks of guns, shells, explosives, and other military supplies were thoroughly protected in dispersed or underground storage depots, and were not vulnerable to air attack.

Physical damage to plant installations by either area or precision attacks, plus decreases due to dispersal forced by the threat of further physical damage, reduced physical productive capacity by roughly the following percentages of pre-attack plant capacity: oil refineries, 83 percent; aircraft engine plants, 75 percent; air-frame plants, 60 percent; electronics and communication equipment plants, 70 percent; army ordnance plants, 80 percent; naval ordnance plants, 28 percent; merchant and naval shipyards, 15 percent; light metals, 35 percent; ingot steel, 15 percent; chemicals, 10 percent.

The economic consequences of the physical damage wrought by air attack are closely interrelated with the concurrent effects of the interdiction of imports, the cumulative effects of under-maintenance of plants, and the declining health, vigor and determination of the Japanese people.

Let us first consider the level of Japanese industrial activity in July 1945, the last full month before surrender. Electric power and coal consumption were both almost exactly 50 percent of the peak reached in 1944. Production efficiency had, however, declined and the overall industrial output was approximately 40 percent of the 1944 peak. Output varied considerably as between industries, hit and unhit plants, and by areas. Output of air frame was 40 percent of the 1944 peak;

aircraft engines, 25 percent; shipbuilding, 25 percent; army ordnance, 45 percent; and naval ordnance, 43 percent. Oil refining had declined to less than 15 percent of the 1943 output. Primary aluminum production was 9 percent of the 1944 peak. Although nitric acid production had declined to about 17 percent of the 1944 peak, explosives production was about 45 percent of the 1944 figure.

In each one of these industries, the occasion for the decline appears to have been different. Electric power consumption fell, not because more power was not available, but because demand had declined. Coal supply was primarily limited by the decline in inter-island shipping from Hokkaido and Kyushu, and the inability of the railroad system completely to fill the gap. Despite a decline in demand, shortages of coal were universal throughout the economy. Airframe production was limited primarily by the continuing effects of the dispersal program brought on by the initial bombing, and aggravated by the subsequent destruction of numerous plants prior to completion of dispersal. Had the level of production been any higher, however, aluminum stocks would have been exhausted and aluminum would have become the controlling bottleneck. In any event, not enough aircraft engines were being produced to equip the airframes. Aircraft engine production was plagued by shortages of special steels, but in July 1945, plant damage and delay in completing the underground and dispersed plants started in the spring of the year temporarily prevented the full use of the small stocks of such steels available at the time. Output of radar and radio equipment was limited by plant capacity, the small factories supplying parts having been destroyed in the Tokyo city raids and many of the larger plants either destroyed or forced to disperse. Shipbuilding and heavy ordnance production were limited by the availability of steel. Oil refineries, aluminum plants and steel plants were basically limited by lack of foreign raw materials. Explosive plants were still using up inventories of nitric acid but would shortly have had to adjust their output to the current availability of nitric acid.

The Japanese labor force had declined in efficiency due to malnutrition and fatigue, the destruction of much of the urban housing and the difficulties of local transportation. Production

hours lost through all causes including absenteeism, sickness, air-raid alerts and enforced idleness rose from 20 percent in 1944 to over 40 percent in July 1945. The size of the labor force employed did not materially decline and the productive hours actually worked remained sufficiently high to indicate that such influence as manpower deficiencies may have had on the over-all level of production in July 1945, was largely ascribable to the continued drafting of highly skilled workers into the armed services and to the inefficient administration of manpower in meeting the rapidly shifting requirements resulting from bombing, rather than to over-all lack of labor.

A Survey investigation of production in plants employing more than 50 employees in 39 representative cities of Japan indicates that production in those plants which suffered any direct physical damage dropped off by July 1945, to 27 percent of peak output in 1944, while production in the undamaged plants fell off to 54 percent. Production in all plants in the sample, including both hit and unhit, dropped to 35 percent of peak by July 1945. It appears probable that the indirect effects of the urban raids through increased absenteeism, disruption of supply lines and administrative confusion fully compensate for diversions of manpower and material from hit to unhit plants. The difference between 54 percent, being the rate of production in unhit plants, and 35 percent, being the average for all plants, is, therefore, a conservative indication of the impact of air attacks, both urban and precision, on production in these cities.

Even though the urban area attacks and attacks on specific industrial plants contributed a substantial percentage to the over-all decline in Japan's economy, in many segments of that economy their effects were duplicative. Most of the oil refineries were out of oil, the alumina plants out of bauxite, the steel mills lacking in ore and coke, and the munitions plants low in steel and aluminum. Japan's economy was in large measure being destroyed twice over, once by cutting off of imports, and secondly by air attack. A further tightening of Japan's shipping situation, so as to eliminate remaining imports from Korea and coastwise and inter-island shipping, coupled with an attack on Japan's extremely vulnerable railroad network, would have extended and cumulated the effects of the shipping attack already made.

Much of Japan's coastal and inter-island traffic had already been forced on to her inadequate railroads. The principal coal mines of Japan are located on Kyushu and Hokkaido. This coal traffic, formerly water borne, was moving by railroads employing the Kanmon tunnels and the Hakkodate-Aomori rail ferry. The railroads on Honshu include few main lines and these lines traverse bridges of considerable vulnerability. Japan is largely a mountainous country lacking automobile roads, trucks or the gasoline to make use of them. A successful attack on the Hakkodate rail ferry, the Kanmon tunnels and 19 bridges and vulnerable sections of line so selected as to set up five separate zones of complete interdiction would have virtually eliminated further coal movements, would have immobilized the remainder of the rail system through lack of coal, and would have completed the strangulation of Japan's economy. This strangulation would have more effectively and efficiently destroyed the economic structure of the country than individually destroying Japan's cities and factories. It would have reduced Japan to a series of isolated communities, incapable of any sustained industrial production, incapable of moving food from the agricultural areas to the cities, and incapable of rapid large-scale movements of troops and munitions.

The Survey believes that such an attack, had it been well-planned in advance, might have been initiated by carrier-based attacks on shipping and on the Hakkodate ferry in August 1944, could have been continued by aerial mining of inland waterways beginning in December 1944, and could have been further continued by initiating the railroad attack as early as April 1945. The Survey has estimated that force requirements to effect complete interdiction of the railroad system would have been 650 B-29 visual sorties carrying 5,200 tons of high explosive bombs. Monthly tonnages equal to one and one-half times that required to effect the original interdiction should have been sufficient, in view of the Japanese lack of preparation and slowness in effecting repairs, to maintain the interdiction by destroying such bridges and other facilities as the Japanese were able to repair. The use of Azon guided bombs, which could have been made available at that time, would have greatly increased accuracy against targets of this type and reduced force requirements to approximately one-sixth of those given above. An inter-

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grated program employing both carrier planes and B-29s would have capitalized on the differing operational capabilities of each.

The economic effects of the transportation attack would have had a direct impact on the Japanese people and on their determination to continue the war. In order to bring maximum pressure on the civilian population and to complicate further the Japanese economic problems, night and bad weather attacks on urban areas could have been carried out simultaneously with the transportation attack. One of the important factors inducing Japan's leaders to accept unconditional surrender was a realization that the Japanese armed forces had lost their ability to protect the people and that under the impact of direct air attack and lowered livelihood their confidence in victory and determination to continue the war were rapidly declining.

THE HEALTH AND MORALE OF THE JAPANESE CIVILIAN POPULATION UNDER ASSAULT

Total civilian casualties in Japan, as a result of 9 months of air attack, including those from the atomic bombs, were approximately 806,000. Of these, approximately 330,000 were fatalities. These casualties probably exceeded Japan's combat casualties which the Japanese estimate as having totaled approximately 780,000 during the entire war. The principal cause of civilian death or injury was burns. Of the total casualties approximately 185,000 were suffered in the initial attack on Tokyo of 9 March 1945. Casualties in many extremely destructive attacks were comparatively low. Yokahoma, a city of 900,000 population, was 47 percent destroyed in a single attack lasting less than an hour. The fatalities suffered were less than 5,000.

The Japanese had constructed extensive fire-breaks by tearing down all houses along selected streets or natural barriers. The total number of buildings torn down in this program, as reported by the Japanese, amounted to 615,000 as against 2,510,000 destroyed by the air attacks themselves. These firebreaks did not effectively stop the spread of fire, as incendiaries were dropped on both sides of the breaks. They did, however, constitute avenues of escape for the civilian population.

The Japanese instituted a civilian-defense organization prior to the war. It was not until the

summer of 1944, however, that effective steps were taken to reduce the vulnerability of Japan's civilian population to air attacks. By that time, the shortage of steel, concrete and other construction materials was such that adequate air-raid shelters could no longer be built. Each family was given the obligation of providing itself with some kind of an excavation covered with bamboo and a little dirt. In addition, tunnels were dug into the sides of hills wherever the topography permitted.

Japanese planning and the means for carrying out the plans were thus deficient for a first-class civilian defense program. In spite of these limitations, such civilian defense measures as they were able to put through contributed substantially in minimizing casualties. School children and other nonessential urban dwellers were evacuated to the country. Those who remained were organized to combat fires and to provide mutual assistance. The air raid warning system was generally efficient. The weight of the individual attacks was, however, far heavier than the Japanese had envisaged or were able to cope with. In the major fire attacks, the civilian defense organizations were simply overwhelmed.

The growing food shortage was the principal factor affecting the health and vigor of the Japanese people. Prior to Pearl Harbor the average per capita caloric intake of the Japanese people was about 2,000 calories as against 3,400 in the United States. The acreage of arable land in Japan is only 3 percent of that of the United States to support a population over half as large. In order to provide the prewar diet, this arable acreage was more intensively cultivated, using more manpower and larger quantities of fertilizer, than in any other country in the world; fishing was developed into a major industry; and rice, soybeans and other foodstuffs amounting to 19 percent of the caloric intake were imported. Despite the rationing of food beginning in April 1941, the food situation became critical. As the war progressed, imports became more and more difficult, the waters available to the fishing fleet and the ships and fuel oil for its use became increasingly restricted. Domestic food production itself was affected by the drafting of the younger males and by an increasing shortage of fertilizers.

By 1944, the average per capita caloric intake had declined to approximately 1,900 calories. By the summer of 1945 it was about 1,680 calories per

capita. Coal miners and heavy industrial workers received higher-than-average rations, the remaining populace, less. The average diet suffered even more drastically from reductions in fats, vitamins and minerals required for balance and adversely affected rates of recovery and mortality from disease and bomb injuries.

Undernourishment produced a major increase in the incidence of beriberi and tuberculosis. It also had an important effect on the efficiency and morale of the people, and contributed to absenteeism among workers.

Survey interrogation of a scientifically designed cross-section sample of the Japanese civilian population revealed a high degree of uniformity as between city and rural sectors of the population and as between various economic and social strata in their psychological reaction to the war. A uniformly high percentage considered Japan's greatest weaknesses to have been in the material realm, either lack of resources, productive plant or modern weapons, and her greatest strength to have been in the Yamato spirit of the Japanese people, their willingness to make every personal sacrifice, including that of life itself, for the Emperor or Japan.

The Japanese people reacted to news of the attack against the United States and its Allies with mingled feelings of fear, insecurity and hope. To a people wearied by 10 years of war in China, it was clear that this would be a major war and not an "incident". The early Japanese military successes, particularly the capture of Singapore and the southern regions, were followed by a wave of optimism and high confidence. Subsequent defeats were studiously withheld from the people or disguised as strategic withdrawals. Prior to the loss of Saipan confidence in eventual victory remained high in spite of exhausting work, poor nutrition and rising black market prices. In June 1944 approximately two percent of the population believed that Japan faced the probability of defeat. The fall of Saipan could not be kept from the Japanese people. Even though the psychological effect of this disaster was far greater on the Japanese leaders and intellectuals than on the mass of the population, all indices of Japanese morale began thereafter to decline. By December 1944 air attacks from the Marianas against the home islands had begun, defeats in the Philippines had been suffered, and the food situation had deteriorated;

10 percent of the people believed Japan could not achieve victory. By March 1945, when the night incendiary attacks began and the food ration was reduced, this percentage had risen to 19 percent. In June it was 46 percent, and just prior to surrender, 68 percent. Of those who had come to this belief over one-half attributed the principal cause to air attacks, other than the atomic bombing attacks, and one-third to military defeats.

Sixty-four percent of the population stated that they had reached a point prior to surrender where they felt personally unable to go on with the war. Of these, less than one-tenth attributed the cause to military defeats, one-quarter attributed the cause to shortages of food and civilian supplies, the largest part to air attack.

A striking aspect of the air attack was the pervasiveness with which its impact on morale blanketed Japan. Roughly one-quarter of all people in cities fled or were evacuated, and these evacuees, who themselves were of singularly low morale, helped spread discouragement and disaffection for the war throughout the islands. This mass migration from the cities included an estimated 8,500,000 persons. Throughout the Japanese islands, whose people had always thought themselves remote from attack, United States planes crisscrossed the skies with no effective Japanese air or antiaircraft opposition. That this was an indication of impending defeat became as obvious to the rural as to the urban population.

Progressively lowered morale was characterized by loss of faith in both military and civilian leaders, loss of confidence in Japan's military might and increasing distrust of government news releases and propaganda. People became short-tempered and more outspoken in their criticism of the government, the war and affairs in general. Until the end, however, national traditions of obedience and conformity, reinforced by the police organization, remained effective in controlling the behavior of the population. The Emperor largely escaped the criticism which was directed at other leaders, and retained the people's faith in him. It is probable that most Japanese would have passively faced death in a continuation of the hopeless struggle, had the Emperor so ordered. When the Emperor announced the unconditional surrender the first reaction of the people was one of regret and surprise, followed shortly by relief.

The interrelation of military, economic and mo-

rale factors was complex. To a certain extent each reacted on the other. In the final analysis the Japanese military machine had lost its purpose when it could no longer protect the Japanese people from destruction by air attack. General Tashima, when asked by the Survey as to his reaction to the Imperial Rescript, stated that surrender had become unavoidable; the Army, even should it repel invasion, could no longer protect the Japanese people from extermination.

THE EFFECTS OF THE ATOMIC BOMBS

On 6 August and 9 August 1945, the first two atomic bombs to be used for military purposes were dropped on Hiroshima and Nagasaki respectively. One hundred thousand people were killed, 8 square miles or over 50 percent of the built-up areas of the two cities were destroyed. The first and crucial question about the atomic bomb thus was answered practically and conclusively; atomic energy had been mastered for military purposes and the overwhelming scale of its possibilities had been demonstrated. A detailed examination of the physical, economic, and morale effects of the atomic bombs occupied the attention of a major portion of the Survey's staff in Japan in order to arrive at a more precise definition of the present capabilities and limitations of this radically new weapon of destruction.

Eyewitness accounts of the explosion all describe similar pictures. The bombs exploded with a tremendous flash of blue-white light, like a giant magnesium flare. The flash was of short duration and accompanied by intense glare and heat. It was followed by a tremendous pressure wave and the rumbling sound of the explosion. This sound is not clearly recollected by those who survived near the center of the explosion, although it was clearly heard by others as much as fifteen miles away. A huge snow-white cloud shot rapidly into the sky and the scene on the ground was obscured first by a bluish haze and then by a purple-brown cloud of dust and smoke.

Such eyewitness accounts reveal the sequence of events. At the time of the explosion, energy was given off in the forms of light, heat, radiation, and pressure. The complete band of radiations, from X- and gamma-rays, through ultraviolet and light rays to the radiant heat of infra-red rays, travelled with the speed of light. The shock wave created by the enormous pressures built up almost instant-

taneously at the point of explosion but moved out more slowly, that is at about the speed of sound. The superheated gases constituting the original fire ball expanded outward and upward at a slower rate.

The light and radiant heat rays accompanying the flash travelled in a straight line and any opaque object, even a single leaf of a vine, shielded objects lying behind it. The duration of the flash was only a fraction of a second, but it was sufficiently intense to cause third degree burns to exposed human skin up to a distance of a mile. Clothing ignited, though it could be quickly beaten out, telephone poles charred, thatch-roofed houses caught fire. Black or other dark-colored surfaces of combustible material absorbed the heat and immediately charred or burst into flames; white or light-colored surfaces reflected a substantial portion of the rays and were not consumed. The heavy black clay tiles which are an almost universal feature of the roofs of Japanese houses bubbled at distances up to a mile. Test of samples of this tile by the National Bureau of Standards in Washington indicates that temperatures in excess of $1,800^{\circ}$ C. must have been generated in the surface of the tile to produce such an effect. The surfaces of granite blocks exposed to the flash scarred and spalled at distances up to almost a mile. In the immediate area of ground zero (the point on the ground immediately below the explosion), the heat charred corpses beyond recognition.

Penetrating rays such as gamma-rays exposed X-ray films stored in the basement of a concrete hospital almost a mile from ground zero. Symptoms of their effect on human beings close to the center of the explosion, who survived other effects thereof, were generally delayed for two or three days. The bone marrow and as a result the process of blood formation were affected. The white corpuscle count went down and the human processes of resisting infection were destroyed. Death generally followed shortly thereafter.

The majority of radiation cases who were at greater distances did not show severe symptoms until 1 to 4 weeks after the explosion. The first symptoms were loss of appetite, lassitude and general discomfort. Within 12 to 48 hours, fever became evident in many cases, going as high as 104° to 105° F., which in fatal cases continued until death. If the fever subsided, the patient usually

showed a rapid disappearance of other symptoms and soon regained his feeling of good health. Other symptoms were loss of white blood corpuscles, loss of hair, and decrease in sperm count.

Even though rays of this nature have great powers of penetration, intervening substances filter out portions of them. As the weight of the intervening material increases the percentage of the rays penetrating goes down. It appears that a few feet of concrete, or a somewhat greater thickness of earth, furnished sufficient protection to humans, even those close to ground zero, to prevent serious after effects from radiation.

The blast wave which followed the flash was of sufficient force to press in the roofs of reinforced-concrete structures and to flatten completely all less sturdy structures. Due to the height of the explosion, the peak pressure of the wave at ground zero was no higher than that produced by a near-miss of a high-explosive bomb, and decreased at greater distances from ground zero. Reflection and shielding by intervening hills and structures produced some unevenness in the pattern. The blast wave, however, was of far greater extent and duration than that of a high-explosive bomb and most reinforced-concrete structures suffered structural damage or collapse up to 700 feet at Hiroshima and 2,000 feet at Nagasaki. Brick buildings were flattened up to 7,300 feet at Hiroshima and 8,500 feet at Nagasaki. Typical Japanese houses of wood construction suffered total collapse up to approximately 7,300 feet at Hiroshima and 8,200 feet at Nagasaki. Beyond these distances structures received less serious damage to roofs, wall partitions, and the like. Glass windows were blown out at distances up to 5 miles. The blast wave, being of longer duration than that caused by high-explosive detonations, was accompanied by more flying debris. Window frames, doors, and partitions which would have been shaken down by a near-miss of a high-explosive bomb were hurled at high velocity through those buildings which did not collapse. Machine tools and most other production equipment in industrial plants were not directly damaged by the blast wave, but were damaged by collapsing buildings or ensuing general fires.

The above description mentions all the categories of the destructive action by the atomic-bomb explosions at Hiroshima and Nagasaki. There were no other types of action. Nothing was va-

porized or disintegrated; vegetation is growing again immediately under the center of the explosions; there are no indications that radio-activity continued after the explosion to a sufficient degree to harm human beings.

Let us consider, however, the effect of these various types of destructive action on the cities of Hiroshima and Nagasaki and their inhabitants.

Hiroshima is built on a broad river delta; it is flat and little above sea level. The total city area is 26 square miles but only 7 square miles at the center were densely built up. The principal industries, which had been greatly expanded during the war, were located on the periphery of the city. The population of the city had been reduced from approximately 340,000 to 245,000 as a result of a civilian defense evacuation program. The explosion caught the city by surprise. An alert had been sounded but in view of the small number of planes the all-clear had been given. Consequently, the population had not taken shelter. The bomb exploded a little northwest of the center of the built-up area. Everyone who was out in the open and was exposed to the initial flash suffered serious burns where not protected by clothing. Over 4 square miles in the center of the city were flattened to the ground with the exception of some 50 reinforced concrete buildings, most of which were internally gutted and many of which suffered structural damage. Most of the people in the flattened area were crushed or pinned down by the collapsing buildings or flying debris. Shortly thereafter, numerous fires started, a few from the direct heat of the flash, but most from overturned charcoal cooking stoves or other secondary causes. These fires grew in size, merging into a general conflagration fanned by a wind sucked into the center of the city by the rising heat. The civilian-defense organization was overwhelmed by the completeness of the destruction, and the spread of fire was halted more by the air rushing toward the center of the conflagration than by efforts of the fire-fighting organization.

Approximately 60,000 to 70,000 people were killed, and 50,000 were injured. Of approximately 90,000 buildings in the city, 65,000 were rendered unusable and almost all the remainder received at least light superficial damage. The underground utilities of the city were undamaged except where they crossed bridges over the rivers cutting through the city. All of the small factories in the

center of the city were destroyed. However, the big plants on the periphery of the city were almost completely undamaged and 94 percent of their workers unhurt. These factories accounted for 74 percent of the industrial production of the city. It is estimated that they could have resumed substantially normal production within 30 days of the bombing, had the war continued. The railroads running through the city were repaired for the resumption of through traffic on 8 August, 2 days after the attack.

Nagasaki was a highly congested city built around the harbor and up into the ravines and river valleys of the surrounding hills. Spurs of these hills coming down close to the head of the bay divide the city roughly into two basins. The built-up area was 3.4 square miles of which 0.6 square miles was given over to industry. The peak wartime population of 285,000 had been reduced to around 230,000 by August 1945, largely by pre-raid evacuations. Nagasaki had been attacked sporadically prior to 9 August by an aggregate of 138 planes which dropped 270 tons of high explosives and 53 tons of incendiary bombs. Some 2 percent of the residential buildings had been destroyed or badly damaged; three of the large industrial plants had received scattered damage. The city was thus comparatively intact at the time of the atomic bombing.

The alarm was improperly given and therefore few persons were in shelters. The bomb exploded over the northwest portion of the city; the intervening hills protected a major portion of the city lying in the adjoining valley. The heat radiation and blast actions of the Nagasaki bomb were more intense than those of the bomb dropped over Hiroshima. Reinforced-concrete structures were structurally damaged at greater distances; the heavy steel-frame industrial buildings of the Mitsubishi steel works and the arms plant were pushed at crazy angles away from the center of the explosion. Contrary to the situation at Hiroshima, the majority of the fires that started immediately after the explosion resulted from direct ignition by the flash.

Approximately 40,000 persons were killed or missing and a like number injured. Of the 52,000 residential buildings in Nagasaki 14,000 were totally destroyed and a further 5,400 badly damaged. Ninety-six percent of the industrial output of Nagasaki was concentrated in the large plants of

the Mitsubishi Co. which completely dominated the town. The arms plant and the steel works were located within the area of primary damage. It is estimated that 58 percent of the yen value of the arms plant and 78 percent of the value of the steel works were destroyed. The main plant of the Mitsubishi electric works was on the periphery of the area of greatest destruction. Approximately 25 percent of its value was destroyed. The dockyard, the largest industrial establishment in Nagasaki and one of the three plants previously damaged by high-explosive bombs, was located down the bay from the explosion. It suffered virtually no new damage. The Mitsubishi plants were all operating, prior to the attack, at a fraction of their capacity because of a shortage of raw materials. Had the war continued, and had the raw material situation been such as to warrant their restoration, it is estimated that the dockyard could have been in a position to produce at 80 percent of its full capacity within 3 to 4 months; that the steel works would have required a year to get into substantial production; that the electric works could have resumed some production within 2 months and been back at capacity within 6 months; and that restoration of the arms plant to 60 to 70 percent of former capacity would have required 15 months.

Some 400 persons were in the tunnel shelters in Nagasaki at the time of the explosion. The shelters consisted of rough tunnels dug horizontally into the sides of hills with crude, earth-filled blast walls protecting the entrances. The blast walls were blown in but all the occupants back from the entrances survived, even in those tunnels almost directly under the explosion. Those not in a direct line with the entrance were uninjured. The tunnels had a capacity of roughly 100,000 persons. Had the proper alarm been sounded, and these tunnel shelters been filled to capacity, the loss of life in Nagasaki would have been substantially lower.

The Survey has estimated that the damage and casualties caused at Hiroshima by the one atomic bomb dropped from a single plane would have required 220 B-29s carrying 1,200 tons of incendiary bombs, 400 tons of high-explosive bombs, and 600 tons of anti-personnel fragmentation bombs, if conventional weapons, rather than an atomic bomb, had been used. One hundred and twenty-five B-29s carrying 1,200 tons of bombs

would have been required to approximate the damage and casualties at Nagasaki. This estimate presupposed bombing under conditions similar to those existing when the atomic bombs were dropped and bombing accuracy equal to the average attained by the Twentieth Air Force during the last 3 months of the war.

As might be expected, the primary reaction of the populace to the bomb was fear, uncontrolled terror, strengthened by the sheer horror of the destruction and suffering witnessed and experienced by the survivors. Prior to the dropping of the atomic bombs, the people of the two cities had fewer misgivings about the war than people in other cities and their morale held up after it better than might have been expected. Twenty-nine percent of the survivors interrogated indicated that after the atomic bomb was dropped they were convinced that victory for Japan was impossible. Twenty-four percent stated that because of the bomb they felt personally unable to carry on with the war. Some 40 percent testified to various degrees of defeatism. A greater number (24 percent) expressed themselves as being impressed with the power and scientific skill which underlay the discovery and production of the atomic bomb than expressed anger at its use (20 percent). In many instances, the reaction was one of resignation.

The effect of the atomic bomb on the confidence of the Japanese civilian population outside the two cities was more restricted. This was in part due to the effect of distance, lack of understanding of the nature of atomic energy, and the impact of other demoralizing experiences. The role of the atomic bomb in the surrender must be considered along with all the other forces which bore upon that question with Japan.

JAPAN'S STRUGGLE TO END THE WAR

Japan's governmental structure was such that in practice the Emperor merely approved the decisions of his advisers. A consensus among the oligarchy of ruling factions at the top was required before any major question of national policy could be decided. These factions, each of which had a different point of view, included the group around the Emperor of whom Marquis Kido, the Lord Keeper of the Privy Seal, was the most important, the ex-premiers constituting the Jushin or body of senior statesmen, and the cab-

inet. The Army and Navy named their own cabinet ministers, who, together with the two chiefs of staff, had direct access to the Emperor. The cabinet could perpetuate itself only so long as it was able to absorb or modify the views of the Army and Navy ministers, who, until the end, were strongly influenced by the fanaticism of the Army officers and many of the younger Navy officers. The ruling oligarchy considered the opinions of the Japanese people as only one among the many factors to be taken into consideration in determining national policy and in no sense as controlling.

The first definitive break in the political coalition which began the war occurred following our success at Saipan. Ten days thereafter, on 16 July 1944, the cabinet headed by General Tojo fell. This significant turn in the course of Japan's wartime politics was not merely the result of an immediate crisis. Even at that date, elements opposing continuation of the war had found means of applying pressure against the fanatic exponents of Japan's militaristic clique. The original factions who had either opposed war before Pearl Harbor, or gone along, or "retired" in the first phase of the conflict recognized as early as the spring of 1944 that Japan was facing ultimate defeat. By that time, United States determination to fight and her ability to mount over-powering offensives in the Pacific, even before the opening of the European Second Front, had already been demonstrated to many of those who had access to all the facts. The political problem of those who saw the situation was to circulate among other leaders in retirement or outside the government a true picture of the war and then unseat the Tojo government in favor of one which would bring the war to an end.

Rear Admiral Takagi of the Navy General Staff made a study between 20 September 1943 and February 1944, of the war's battle lessons up to that time. Based on analysis of air, fleet and merchant ship losses, Japan's inability to import essential materials for production, and the potentiality of air attacks on the home islands, Takagi concluded that Japan could not win and should seek a compromise peace. His study and a similar one made by Sakomizu of the Cabinet Planning Board documented the fears of the Jushin, and through them of Marquis Kido, that all was not well with Tojo's prosecution of the

war. With the loss of Saipan, it was possible to build up sufficient pressure to force Tojo's retirement.

The government of General Koiso, who was chosen by the ever-cautious Kido to head the succeeding cabinet, did not have the strength to stand up to the military and was a disappointment to the more enthusiastic peace makers. In spite of original instructions to give "fundamental reconsideration" to the problem of continuing the war, his only accomplishment in that direction was the creation of a Supreme War Direction Council, an inner cabinet which supplied the mechanism through which the problem of surrender was eventually resolved.

The conviction and strength of the peace party was increased by the continuing Japanese military defeats, and by Japan's helplessness in defending itself against the ever-growing weight of air attack on the home islands. On 7 April 1945, less than a week after United States landings on Okinawa, Koiso was removed and Marquis Kido installed Admiral Suzuki as premier. Kido testified to the Survey that, in his opinion, Suzuki alone had the deep conviction and personal courage to stand up to the military and bring the war to an end.

Early in May 1945, the Supreme War Direction Council began active discussion of ways and means to end the war, and talks were initiated with Soviet Russia seeking her intercession as mediator.

The talks by the Japanese ambassador in Moscow and with the Soviet ambassador in Tokyo did not make progress. On 20 June the Emperor, on his own initiative, called the six members of the Supreme War Direction Council to a conference and said it was necessary to have a plan to close the war at once, as well as a plan to defend the home islands. The timing of the Potsdam Conference interfered with a plan to send Prince Konoye to Moscow as a special emissary with instructions from the cabinet to negotiate for peace on terms less than unconditional surrender, but with private instructions from the Emperor to secure peace at any price. Although the Supreme War Direction Council, in its deliberations on the Potsdam Declaration, was agreed on the advisability of ending the war, three of its members, the Prime Minister, the Foreign Minister and the Navy Minister, were prepared to accept uncondi-

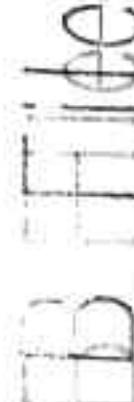
tional surrender, while the other three, the Army Minister, and the Chiefs of Staff of both services, favored continued resistance unless certain mitigating conditions were obtained.

On 6 August the atomic bomb was dropped on Hiroshima, and on 9 August Russia entered the war. In the succeeding meetings of the Supreme War Direction Council, the differences of opinion previously existing as to the Potsdam terms persisted exactly as before. By using the urgency brought about through fear of further atomic bombing attacks, the Prime Minister found it possible to bring the Emperor directly into the discussions of the Potsdam terms. Hirohito, acting as arbiter, resolved the conflict in favor of unconditional surrender.

The public admission of defeat by the responsible Japanese leaders, which constituted the political objective of the United States offensive begun in 1943, was thus secured prior to invasion and while Japan was still possessed of some 2,000,000 troops and over 9,000 planes in the home islands. Military defeats in the air, at sea and on the land, destruction of shipping by submarines and by air, and direct air attack with conventional as well as atomic bombs, all contributed to this accomplishment.

There is little point in attempting precisely to impute Japan's unconditional surrender to any one of the numerous causes which jointly and cumulatively were responsible for Japan's disaster. The time lapse between military impotence and political acceptance of the inevitable might have been shorter had the political structure of Japan permitted a more rapid and decisive determination of national policies. Nevertheless, it seems clear that, even without the atomic bombing attacks, air supremacy over Japan could have exerted sufficient pressure to bring about unconditional surrender and obviate the need for invasion.

Based on a detailed investigation of all the facts, and supported by the testimony of the surviving Japanese leaders involved, it is the Survey's opinion that certainly prior to 31 December 1945, and in all probability prior to 1 November 1945, Japan would have surrendered even if the atomic bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated.



CONCLUSION

The foregoing pages tell of the results achieved by air power in each of its several roles in the war in the Pacific, including the effects of the atomic bombs. The Survey has already reported on the results achieved by air power in the European war. It remains to seek out the degree to which the Pacific study modifies, adds to or supports the signposts to the future which were suggested by the European study; to state the extent to which hindsight suggests that air power might have been differently or better employed in the Pacific; to discuss the impact of the existence of atomic bombs on the role of air power; and to state the Survey's recommendations. First, however, it is necessary to point out some of the unique features of the Pacific war which must be borne in mind while considering lessons to be learned from it.

Uniqueness of Pacific War

The Pacific war was unique in many respects, as was the European war, and great reservation should be used in assuming that what was effective or not effective under those circumstances would be similarly effective at other times and under different circumstances. Japan's initial war strategy called for a war of limited objectives. Her capabilities did not permit an attack on our basic supporting strength. She was, however, a fanatically determined enemy, well prepared initially, and the fighting quality of her soldiers, seamen and airmen should not be underestimated.

Japan's geographical situation determined that the Pacific war should in large measure be a war for control of the sea and to insure control of the sea, for control of the air over it. As a result, attacks against warships and merchant ships and amphibious operations for possession of island positions on which forward bases could be located were close to the heart of the struggle. Carrier task forces, surface ships to provide logistic support, and submarines therefore assumed roles of unusual importance.

Japan's industrial potential was approximately 10 percent of that of the United States. Even though her research and technical design work was not purely imitative, her ability to develop reliable operating equipment in the new fields was low. Her radar and communications equipment was weak. She could not build sufficient ships or escort vessels. She lacked construction equipment

to build adequate airfields. She was always hampered by a lack of oil. Her antiaircraft was outmoded. She could not economically afford to build adequate shelters for her population. She could not both disperse her industry and also repair damaged plants. She chose dispersal rather than repair, but she had insufficient means even to disperse effectively.

Signposts

Not only the uniqueness of the Pacific war but new developments in weapons and tactics make it impossible to assert that signposts to the future derived from the Pacific war will apply with equal force to other situations. The Survey believes, however, that the following signposts as to the role of air power should be given thorough consideration by those working out the solutions to new problems arising under differing conditions.

1. Control of the air was essential to the success of every major military operation. Control of the air enabled surface vessels to sail the seas as far as that control extended, even within range of enemy land-based airplanes. Control of the air permitted amphibious landings at any point where that control could be assured. Control of the air permitted close air support to ground forces, the effectiveness of which was decisive wherever fully employed. Control of the air over lines of communications permitted effective interdiction of them to the enemy and preserved them to ourselves. Control of the air over the Japanese home islands permitted the destruction by long-range bombing of such of her industries and cities as we chose to attack. The first objective of all commanders in the Pacific war, whether ground, sea or air, whether American, Allied, or Japanese, was to assure control of the air.

2. Control of the air was not easily achieved, and involved the coordinated application of all the resources of the nation. Air power consisted not merely of the planes and pilots that engaged the enemy, but of all the sources of strength that supported, reinforced and exploited control of the air. It was coordinated teamplay of ground, sea and air forces, both ground-based and carrier-based, and their supporting services, backed up by the full effort of all phases of the home front that enabled us to secure control of the air, at first locally and then more generally, culminating in

virtual freedom of the skies over the Japanese home islands themselves.

3. The limitations of air control deserve special mention. It was never completely possible to deny the air to the enemy. It was considered that we had control of the air when the enemy could not operate in it without prohibitive losses in relation to results achieved, while our own planes could operate in it at will and with acceptable risk of loss. The Japanese increased their ratio of results achieved to losses by adopting Kamikaze tactics. This was a measure of desperation, but the results obtained were considerable and, had they been much greater, might have caused us to withdraw or to modify our strategic plans. The principle involved indicates the degree to which defensive air control must be improved or enemy bases kept beyond the range of enemy suicide planes or guided missiles from such land or sea as we propose to use.

4. Given air control, there were also limitations as to the specific results which could be achieved in exploiting such control by aircraft carrying conventional high-explosive bombs. Fox holes, underground emplacements and other prepared defenses could not in many cases be reduced, and it was necessary to eliminate remaining ground forces in costly close-range fighting even though these forces were isolated and completely cut off from supplies and reinforcements.

Weather and darkness limited exploitation of air control, but as the war progressed technical and tactical advances were made which progressively reduced these limitations.

Combat radius of fighters and time on patrol at maximum radius, although great by previously existing standards, required that airfields or carriers be available within 300 nautical miles or less of the critical areas of surface combat for optimum fighter cover. The effective radius of our longest range bombers was limited to 1,500 miles and bases still closer to Japan were considered essential for emergency landing and fighter support.

The importance of reducing these limitations of control of the air and its exploitation by the application of research and development work in postwar years is obvious.

5. The experience of the Pacific war supports the findings of the Survey in Europe that heavy, sustained and accurate attack against carefully selected targets is required to produce decisive re-

sults when attacking an enemy's sustaining resources. It further supports the findings in Germany that no nation can long survive the free exploitation of air weapons over its homeland. For the future it is important fully to grasp the fact that enemy planes enjoying control of the sky over one's head can be as disastrous to one's country as its occupation by physical invasion.

Hindsight

Hindsight inevitably suggests that in some respects air power might have been differently or better employed.

Prior to the European war, we underestimated the predominant role that air power was to play and allocated to it too small a share of even the inadequate resources then available to the Army and Navy. At the outbreak of the Pacific war, our deficiency was particularly great in modern land-based fighters and in carriers. One thousand planes in the Philippines, at least equal in performance to the best then available to the Japanese, including types effective against shipping, well-manned, equipped and supplied, and dispersed on some 50 airfields, would have seriously impeded the original Japanese advance if knowledge of their existence had not entirely dissuaded the Japanese from making the attempt. The loss of relatively antiquated battleships at Pearl Harbor had little effect on the Navy's combat capabilities at that time, while the addition of a few carriers would have enormously increased its capabilities. Larger overall appropriations to the armed forces, beginning at the time of Japanese occupation of Manchuria when the threat to peace in the Far East became evident, might have made war unnecessary and would have paid for itself many times over in reduced casualties and expenditures had war still been unavoidable.

Upon entering the war, we were deficient not only in numbers, but in quality of many of our aircraft types. We were forced thereafter into hasty and costly modification and technical development programs to raise the performance of our aircraft to acceptable standards. These programs could have been conducted more efficiently and economically during prewar years.

In the actual conduct of the war we more quickly grasped the strategic revolution brought about by the capabilities of air power than did the Japanese. By the end of 1943 we had achieved

through combat and the augmentation of our forces, such clear cut superiority over the Japanese in all elements of air power that eventual victory was assured.

In exploiting this superiority greater economy of effort was possible. The structure of our pre-war military organization provided no means, short of the President, for integrating our armed forces. Under the pressure of war the Joint Chiefs of Staff was the most decisive mechanism then possible to fill this gap. Each of its members had in effect the power of veto and the required unanimity was produced by compromise. It proved impossible to agree on an overall commander for the Pacific as a whole. Our military and economic strength, however, made it possible to plan and execute a dual line of advance across the Pacific and to mount an air attack of sufficient weight to induce unconditional surrender concurrently with the preparation of a full scale invasion.

~~Capture of the Gilbert Islands does not appear in hindsight to have been wholly necessary.~~ Attacks on Rabaul and other bypassed positions were continued longer and in greater volume than required. The effectiveness of high-level attack in softening up prepared defenses and in sinking manoeuvring ships was overestimated. Prior to the occupation of the Marianas, B-29s could have been more effectively used in coordination with submarines for search, low-level attacks and mining in accelerating the destruction of Japanese shipping, or in destroying oil and metal plants in the southern areas, than in striking the Japanese "Inner Zone" from China bases.

In the final assault on the Japanese home islands we were handicapped by a lack of prewar economic intelligence. Greater economy of effort could have been attained, and much duplicative effort avoided, by extending and accelerating the strangulation of the Japanese economy already taking place as a result of prior attacks on shipping. This could have been done by an earlier commencement of the aerial mining program, concentration of carrier plane attacks in the last months of the war on Japan's remaining merchant shipping rather than on her already immobilized warships, and a coordinated B-29 and carrier attack on Japan's vulnerable railroad system beginning in April 1945.

We underestimated the ability of our air attack on Japan's home islands, coupled as it was with

blockade and previous military defeats, to achieve unconditional surrender without invasion. By July 1945, the weight of our air attack had as yet reached only a fraction of its planned proportion, Japan's industrial potential had been fatally reduced, her civilian population had lost its confidence in victory and was approaching the limit of its endurance, and her leaders, convinced of the inevitability of defeat, were preparing to accept surrender. The only remaining problem was the timing and terms of that surrender.

Having entered the war inadequately prepared, we continued all-out ~~war production and the~~ mobilization of all resources to bring ever increasing pressure on Japan, beyond the time when this was still reasonably required.

The Impact of Atomic Bombs on the Role of Air Power

Does the existence of atomic bombs invalidate all conclusions relative to air power based on pre-atomic experience? It is the Survey's opinion that many of the pre-existing yardsticks are revolutionized, but that certain of the more basic principles and relationships remain. The atomic bomb, in its present state of development, raises the destructive power of a single bomber by a factor of somewhere between 50 and 250 times, depending upon the nature and size of the target. The capacity to destroy, given control of the air and an adequate supply of atomic bombs, is beyond question. Unless both of these conditions are met, however, any attempt to produce war-decisive results through atomic bombing may encounter problems similar to those encountered in conventional bombing.

The problem of control of the air, primarily of our own air, and should we be attacked, of the enemy's air as well, becomes of even greater significance. The most intense effort must be devoted to perfecting defensive air control both by day and night, through the improvement of early warning and fighter control apparatus, anti-aircraft ordnance and defensive fighters, not only from the standpoint of technological improvement and volume, but also of disposition and tactics. It would be rash, however, to predict an increase in the effectiveness of defensive control sufficient to insure that not a single enemy plane or guided missile will be able to penetrate. It therefore behoves us to accept the possibility that at least a small

produced limited strategic results.

number of enemy planes or guided missiles may be able to evade all our defenses and to attack any objective within range.

The threat of immediate retaliation with a striking force of our own should deter any aggressor from attacking.

If we are not to be overwhelmed out of hand, in the event we are nevertheless attacked, we must reduce materially our vulnerability to such attack. The experience of both the Pacific and European wars emphasizes the extent to which civilian and other forms of passive defense can reduce a country's vulnerability to air attack. Civilian injuries and fatalities can be reduced, by presently known techniques, to one-twentieth or less of the casualties which would be suffered were these techniques not employed. This does not involve moving everything underground, but does involve a progressive evacuation, dispersal, warning, air-raid shelter, and post-raid emergency assistance program, the foundations for which can only be laid in peacetime. The analysis of the effects of the atomic bombs at Hiroshima and Nagasaki indicates that the above statement is just as true and much more terrifyingly significant in an age of atomic bombs than it was in an age of conventional weapons. Similarly, economic vulnerability can be enormously decreased by a well worked out program of stockpiles, dispersal and special construction of particularly significant segments of industry. Such a program in the economic field can also be worked out satisfactorily only in peacetime.

In the strictly military field the impact of atomic weapons and guided missiles on strategy and tactics can only be developed by military specialists. It is the Survey's opinion, however, that mature study by such specialists will support the conclusion that dispersal of military forces, and therefore space and distance in which to effect such dispersal, will be significant considerations; that heavy bombers similar to those used in this war will not be able to operate effectively and on a sustained basis much beyond the range of protective fighters, and that newer types of offensive weapons and new tactics must be developed to do so; that forward air bases will have to be defended or more advanced bases acquired step by step in actual combat; and that the basic principles of war, when applied to include the field of the new weapons, will be found to remain. If such be the case, atomic weapons will not have eliminated the

need for ground troops, for surface vessels, for air weapons, or for the full coordination among them, the supporting services and the civilian effort, but will have changed the context in which they are employed to such a degree that radically changed equipment, training and tactics will be required.

Recommendations

Over and above the numerous recommendations scattered throughout preceding sections of this report, of which the recommendation that we develop protection for our civilian population and for our economy is one of the most important, the Survey has been impressed with the need for concrete and prompt action to encourage adequate research and development; to assure adequate intelligence during peacetime; to integrate our military establishments; and to increase the national appreciation of the necessity for continued strength of the United States as a force for peace.

Research and development.—The "blitzkrieg" technique is of enormous danger. This conclusion, derived initially from the European war, is strongly supported by the Japanese experience. A mobilized and well-trained striking force enjoying a certain technical superiority can overwhelm in short order the forces of a country of far greater basic long-term strength. In the opening phases of the Pacific war the Japanese were able to overrun 130,000,000 people and an area of enormous strategic importance in the space of a few months. This was true in spite of the fact that from the time of the Munich conference in 1938 we had been on notice that aggression against the peace of the world was possible and that the intervening years and the experience of our Allies had been invaluable in permitting us to take the necessary steps to revise our strategic concepts, to apply our advanced scientific and development resources to the improvement of our weapons, and to begin our industrial and military mobilization. The distances of the Pacific fortunately gave us space, and therefore time, in which to absorb the initial blow while our increasing strength and Japan's increasing logistic problems reversed the initial disadvantages facing our advanced forces.

Science has increased tremendously the destructive capability of modern weapons and promises further developments in the future. Given an adequate supply of atomic bombs, the B-29s based in the Marianas had sufficient strength to have ef-

fктивely destroyed in a single day every Japanese city with a population in excess of 30,000 people. In the future, national security will depend to a large degree on technical superiority of weapons and on operating and maintenance proficiency of personnel. Peacetime military strategic planning must be pointed to and supported by a vigorous program of scientific research and development.

If the United States is not to be forced to hasty and inadequate mobilization every time the threat of aggression arises in the world, it is essential that in the field of military weapons and tactics she be technically not merely abreast of, but actually ahead of any potential aggressor. It is not generally realized the degree to which basic scientific research was neglected in the United States during the course of the war in order to concentrate on the belated development of the specific weapons immediately required, nor the degree to which we lagged behind Germany in advanced aerodynamics, jet propulsion and the development of guided missiles. In air armament and torpedoes, even the Japanese were ahead of us. One or two years' lag in either basic research or in the development of reliable military application of such research can only be made up with difficulty, if at all. This type of work has become so complex that expenditures for research and development in the order of one billion dollars annually may be required to assure an acceptable degree of national security.

Intelligence.—At the start of the Pacific war our strategic intelligence was highly inadequate, and our overall war plans, insofar as they were based on faulty information and faulty interpretation of accurate information, were unrealistic. After Pearl Harbor the obtaining and analysis of economic and industrial information necessary to the planning of an attack on Japan's sustaining resources required several years of the most strenuous effort and even then substantial gaps remained. If a comparable lack of intelligence should exist at the start of a future national emergency, it might prove disastrous.

In the field of operational intelligence considerable forward strides were made during the Pacific war. The requirements in this field for a large volume of minutely detailed and accurate work, for complex analysis geared to rapidly changing capabilities of forces and weapons, and for speed, all place a heavy burden on training, competence

and organization. These requirements were not fully met in the Pacific war; the deficiency was at times serious. This was in large measure traceable to a prewar lack of trained and competent operational intelligence officers to provide an adequate nucleus for an expanding organization.

The basis for adequate intelligence can only be laid in peacetime. The solution to our problems in this field appears in part to be the greater centralization to be provided by the National Intelligence Authority, particularly in securing more adequate coordination and dissemination. It appears also to lie in close integration into the various operating organizations of appropriate intelligence units, adequate budgets and personnel for intelligence work, and a sufficient increase in the prestige attached to such work to attract the highest quality of personnel. This latter can only come from increased training in intelligence and active appreciation of its functions on the part of other Army, Navy, and Government officials. The present lack of recognized responsibility for intelligence work by the various operating organizations and the present shortage of trained and competent intelligence personnel give cause for alarm and require correction.

Integration of our military establishments.—Organizational deficiencies in the Japanese Government contributed to Japan's entering a disastrous war and subsequently contributed to the absoluteness of her defeat. The form of her governmental organization provided no means for civilian control of the military or for obtaining effective coordination between the Army and Navy. Military policy was inconsistent with the foreign policy of the cabinet, the Japanese Army and Navy tending to make their own foreign policy in accordance with their individual aims, capabilities and requirements. During the war, bureaucratic rivalry between her Army and Navy impeded coordinated strategic and tactical planning, the proper employment of her air power, the development of adequate logistics and the efficient utilization of her economic resources. The existence of such joint or combined organizations as the Supreme War Council, the Supreme War Direction Council, the Board of Field Marshals and Fleet Admirals, the Imperial General Headquarters served mainly to hide the fact that real unity, integration, and coordination were conspicuously lacking.

B File

Even though the United States did not achieve unity of command in the Pacific as a whole, each theater commander used the air, ground and sea forces assigned to him as an integrated or co-ordinated team. Coordination and compromise among theater commanders was largely achieved in all major respects. Such lack of complete integration as existed was in a large measure traceable back through the structure of the Joint Chiefs of Staff to the basic structure of our prewar military organization.

The Congress of the United States is today considering legislation for the reorganization and integration of our military establishments. The Survey is of the opinion that the prompt passage of appropriate legislation is in the national interest.

The lessons of the Pacific war strongly support that form of organization which provides unity of command, capable of clear and effective decision at the top, strengthens civilian control and thus provides closer integration of military policy with foreign and domestic policy, and favors a high degree of coordination in planning, intelligence, and research and development. Such unity of command should, however, decentralize administrative burdens and permit specialized training and the free development of the component forces, even at the risk of some duplication.

Within a department of common defense which provides unity of command and is itself oriented toward air and new weapons, the Survey believes that, in addition to the Army and the Navy, there should be an equal and coordinate position for a third establishment. To this establishment should be given primary responsibility for passive and active defense against long range attack on our cities, industries and other sustaining resources; for strategic attack, whether by airplane or guided missile; and for all air units other than carrier air and such land-based air units as can be more effective as component parts of the Army or Navy. The mission of such a new establishment would differ considerably from that of an autonomous air force and would require broader experience than has been included in the Army air forces alone.

, in certain respects, require additional and broader experience than has heretofore been required by the Army air forces alone.

Strength as a force for peace.—The Survey's report on the European war stated that the great lesson to be learned in the battered cities of England and the ruined cities of Germany is that the best way to win a war is to prevent it from occurring. This is fully supported by the example of the devastated cities of Japan and their unhappy and hungry surviving inhabitants. The prevention of war must be the ultimate end to which our best efforts are devoted. It has been suggested, and wisely so, that this objective is well served by insuring the strength and the security of the United States. The United States was founded and has since lived upon principles of tolerance, freedom and good will at home and abroad. Strength based on these principles is no threat to world peace. Prevention of war will not be furthered by neglect of strength or lack of foresight or alertness on our part. Those who contemplate evil and aggression find encouragement in such neglect. Hitler relied heavily upon it. The Japanese would never have attacked Pearl Harbor had they not correctly assessed the weakness of our defenses in the Pacific and had they not incorrectly assessed the fighting determination of the United States when attacked.

Suggestions for assuring the military strength and security of the United States are by no means intended as a recommendation for a race in arms with other nations; nor do they reflect a lack of confidence in the prospect of international relationships founded upon mutual respect and good will which will themselves be a guarantee against future wars. The development of an intelligent and coordinated approach to American security can and should take place within the framework of the security organization of the United Nations.

The United States as a member of the United Nations has covenanted not to use force except in defense of law as embodied in the purposes and principles of the United Nations' Charter. As one of the great powers we must be prepared to act in defense of law and to do our share in assuring that other nations live up to their covenant.

The United States must have the will and the strength to be a force for peace.



U. S. GOVERNMENT PRINTING OFFICE: 1945

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E.O. 11652, Sec. 3(E) and 3(D) or (E)

OSD letter, 4-12-74
4-12-74

By ALBERT HARRIS Date 4-12-74

WAR DEPARTMENT
WASHINGTON

September 11, 1945.

Dear Mr. President:

In handing you today my memorandum about our relations with Russia in respect to the atomic bomb, I am not unmindful of the fact that when in Potsdam I talked with you about the question whether we could be safe in sharing the atomic bomb with Russia while she was still a police state and before she put into effect provisions assuring personal rights of liberty to the individual citizen.

I still recognize the difficulty and am still convinced of the importance of the ultimate importance of a change in Russian attitude toward individual liberty but I have come to the conclusion that it would not be possible to use our possession of the atomic bomb as a direct lever to produce the change. I have become convinced that any demand by us for an internal change in Russia as a condition of sharing in the atomic weapon would be so resented that it would make the objective we have in view less probable.

I believe that the change in attitude toward the individual in Russia will come slowly and gradually and I am satisfied that we should not delay our approach to Russia in the matter of the atomic bomb until that process has been completed. My reasons



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Secretary's Files

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DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
OSD letter, May 5, 1972
By M.J.C., NARS Date 2-27-74

-2-

are set forth in the memorandum I am handing you today. Furthermore, I believe that this long process of change in Russia is more likely to be expedited by the closer relationship in the matter of the atomic bomb which I suggest and the trust and confidence that I believe would be inspired by the method of approach which I have outlined.

Faithfully yours,

Henry L. Stimson

Secretary of War.

The President,

The White House.

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WAR DEPARTMENT
WASHINGTON



DECLASSIFIED
E.O. 11652, Sec. 3(E) and 5(D) or (E)
OSD letter, May 6, 1972
By [unclear], NARS Date 2-29-72

BMB3

11 September 1945

MEMORANDUM FOR THE PRESIDENT:

Subject: Proposed Action for Control of Atomic Bombs

The advent of the atomic bomb has stimulated great military and probably even greater political interest throughout the civilized world. In a world atmosphere already extremely sensitive to power, the introduction of this weapon has profoundly affected political considerations in all sections of the globe.

In many quarters it has been interpreted as a substantial offset to the growth of Russian influence on the continent. We can be certain that the Soviet government has sensed this tendency and the temptation will be strong for the Soviet political and military leaders to acquire this weapon in the shortest possible time. Britain in effect already has the status of a partner with us in the development of this weapon. Accordingly, unless the Soviets are voluntarily invited into the partnership upon a basis of cooperation and trust, we are going to maintain the Anglo-Saxon bloc over against the Soviet in the possession of this weapon. Such a condition will almost certainly stimulate feverish activity on the part of the Soviet toward the development of this bomb in what will in effect be a secret armament race of a rather desperate character. There is evidence to indicate that such activity may have already commenced.

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E.O. 11652, Sec. 3(E) and 5(D) or (E)

OSD letter, May 6, 1972

SYNTHETIC, NARS Date 2/12/73

If we feel, as I assume we must, that civilization demands that some day we shall arrive at a satisfactory international arrangement respecting the control of this new force, the question then is how long we can afford to enjoy our momentary superiority in the hope of achieving our immediate peace council objectives.

Whether Russia gets control of the necessary secrets of production in a minimum of say four years or a maximum of twenty years is not nearly as important to the world and civilization as to make sure that when they do get it they are willing and cooperative partners among the peace loving nations of the world. It is true that if we approach them now, as I would propose, we may be gambling on their good faith and risk their getting into production of bombs a little sooner than they would otherwise.

To put the matter concisely, I consider the problem of our satisfactory relations with Russia as not merely connected with but as virtually dominated by the problem of the atomic bomb. Except for the problem of the control of that bomb, those relations, while vitally important, might not be immediately pressing. The establishment of relations of mutual confidence between her and us could afford to await the slow progress of time. But with the discovery of the bomb, they become immediately emergent. Those relations may be perhaps irretrievably embittered by the way in which we approach the solution of the bomb with Russia. For if we fail to approach them

now and merely continue to negotiate with them, having this weapon rather ostentatiously on our hip, their suspicions and their distrust of our purposes and motives will increase. It will inspire them to greater efforts in an all out effort to solve the problem. If the solution is achieved in that spirit, it is much less likely that we will ever get the kind of covenant we may desperately need in the future. This risk is, I believe, greater than the other, inasmuch as our objective must be to get the best kind of international bargain we can — one that has some chance of being kept and saving civilization not for five or for twenty years, but forever.

The chief lesson I have learned in a long life is that the only way you can make a man trustworthy is to trust him; and the surest way to make him untrustworthy is to distrust him and show your distrust.

If the atomic bomb were merely another though more devastating military weapon to be assimilated into our pattern of international relations, it would be one thing. We could then follow the old custom of secrecy and nationalistic military superiority relying on international caution to prescribe the future use of the weapon as we did with gas. But I think the bomb instead constitutes merely a first step in a new control by man over the forces of nature too revolutionary and dangerous to fit into the old concepts. I think it really caps the climax of the race between man's growing technical

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E.O. 11652. Sec. 3(D) and 5(D) or (E)

OSD letter, May 1, 1972

By ~~RELEASER~~: MARS Date: 2-12-25

power for destructiveness and his psychological power of self-control and group control — his moral power. If so, our method of approach to the Russians is a question of the most vital importance in the evolution of human progress.

Since the crux of the problem is Russia, any contemplated action leading to the control of this weapon should be primarily directed to Russia. It is my judgment that the Soviet would be more apt to respond sincerely to a direct and forthright approach made by the United States on this subject than would be the case if the approach were made as a part of a general international scheme, or if the approach were made after a succession of express or implied threats or near threats in our peace negotiations.

My idea of an approach to the Soviets would be a direct proposal after discussion with the British that we would be prepared in effect to enter an arrangement with the Russians, the general purpose of which would be to control and limit the use of the atomic bomb as an instrument of war and so far as possible to direct and encourage the development of atomic power for peaceful and humanitarian purposes. Such an approach might more specifically lead to the proposal that we would stop work on the further improvement in, or manufacture of, the bomb as a military weapon, provided the Russians and the British would agree to do likewise. It might also provide that we would be willing to impound what bombs we now

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E.O. 11652, Sec. (ME) and (SD) or (E)

OSD letter, May 8, 1972

By ~~AMERICAN NASS Date 2/12/72~~

have in the United States provided the Russians and the British would agree with us that in no event will they or we use a bomb as an instrument of war unless all three Governments agree to that use. We might also consider including in the arrangement a covenant with the U. K. and the Soviets providing for the exchange of benefits of future developments whereby atomic energy may be applied on a mutually satisfactory basis for commercial or humanitarian purposes.

I would make such an approach just as soon as our immediate political considerations make it appropriate.

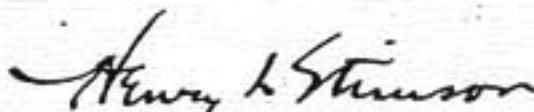
I emphasize perhaps beyond all other considerations the importance of taking this action with Russia as a proposal of the United States - backed by Great Britain - but peculiarly the proposal of the United States. Action of any international group of nations, including many small nations who have not demonstrated their potential power or responsibility in this war would not, in my opinion, be taken seriously by the Soviets. The loose debates which would surround such proposal, if put before a conference of nations, would provoke but scant favor from the Soviet. As I say, I think this is the most important point in the program.

After the nations which have won this war have agreed to it, there will be ample time to introduce France and China into the covenants and finally to incorporate the agreement into the scheme of the United Nations. The use of this bomb has been accepted by

~~TOP SECRET~~

DECLASSIFIED
E.O. 11652, Sec. 3(D) and 5(D) or (E)
OSD letter, May 1942
By MARY LANE, NAMS Date 2-12-76

the world as the result of the initiative and productive capacity of the United States, and I think this factor is a most potent lever toward having our proposals accepted by the Soviets, whereas I am most skeptical of obtaining any tangible results by way of any international debate. I urge this method as the most realistic means of accomplishing this vitally important step in the history of the world.



Secretary of War.

~~TOP SECRET~~

December 16, 1945

My dear Doctor Compton:

I appreciated very much your sending me the article from The Atlantic Monthly - If The Atomic Bomb Had Not Been Used. It is the first sensible statement I have seen on the subject.

I have also asked the former Secretary of War, Henry L. Stimson, to assemble the facts and get them into record form and, I think, he is doing that.

Your statement in The Atlantic Monthly is a fair analysis of the situation except that the final decision had to be made by the President, and was made after a complete survey of the whole situation had been made. The conclusions reached were substantially those set out in your article.

The Japanese were given fair warning and were offered the terms, which they finally accepted, well in advance of the dropping of the bomb. I imagine the bomb caused them to accept the terms.

Sincerely yours,

HARRY S. TRUMAN

Dr. Karl T. Compton
President
Massachusetts Institute of Technology
Cambridge 39, Massachusetts



B



IF THE ATOMIC BOMB HAD NOT BEEN USED

by KARL T. COMPTON

ABOUT a week after V-J Day I was one of a small group of scientists and engineers interrogating an intelligent, well-informed Japanese Army officer in Yokohama. We asked him what, in his opinion, would have been the next major move if the war had continued. He replied: "You would probably have tried to invade our homeland with a landing operation on Kyushu about November 1. I think the attack would have been made on such and such beaches."

"Could you have repelled this landing?" we asked, and he answered: "It would have been a very desperate fight, but I do not think we could have stopped you."

"What would have happened then?" we asked.

He replied: "We would have kept on fighting until all Japanese were killed, but we would not have been defeated," by which he meant that they would not have been disgraced by surrender.

It is easy now, after the event, to look back and say that Japan was already a beaten nation, and to ask what therefore was the justification for the use of the atomic bomb to kill so many thousands of helpless Japanese in this inhuman way; furthermore, should we not better have kept it to ourselves as a secret weapon for future use, if necessary? This argument has been advanced often, but it seems to me utterly fallacious.

I had, perhaps, an unusual opportunity to know the pertinent facts from several angles, yet I was without responsibility for any of the decisions. I can therefore speak without doing so defensively. While my role in the atomic bomb development was a very minor one, I was a member of the group called together by Secretary of War Stimson to assist him in plans for its test, use, and subsequent handling. Then, shortly before Hiroshima, I became attached to General MacArthur in Manila, and lived for two months with his staff. In this way

A physicist and the first of three brothers to become college presidents, KARL T. COMPTON has been the head of Massachusetts Institute of Technology since 1930. During the war he served in a number of war projects in close association with Dr. Vannevar Bush and President James B. Conant of Harvard. He was a member of the National Defense Research Committee, Chief of the Office of Field Service of the OSRD, and an observer on General MacArthur's staff directly after V-J Day.

I learned something of the invasion plans and of the sincere conviction of these best-informed officers that a desperate and costly struggle was still ahead. Finally, I spent the first month after V-J Day in Japan, where I could ascertain at first hand both the physical and the psychological state of that country. Some of the Japanese whom I consulted were my scientific and personal friends of long standing.

From this background I believe, with complete conviction, that the use of the atomic bomb saved hundreds of thousands — perhaps several millions — of lives, both American and Japanese; that without its use the war would have continued for many months; that no one of good conscience knowing, as Secretary Stimson and the Chiefs of Staff did, what was probably ahead and what the atomic bomb might accomplish could have made any different decision. Let some of the facts speak for themselves.

Was the use of the atomic bomb inhuman? All war is inhuman. Here are some comparisons of the atomic bombing with conventional bombing. At Hiroshima the atomic bomb killed about 80,000 people, pulverized about five square miles; and wrecked an additional ten square miles of the city, with decreasing damage out to seven or eight miles from the center. At Nagasaki the fatal casualties were 45,000 and the area wrecked was considerably smaller than at Hiroshima because of the configuration of the city.

Compare this with the results of two B-29 incendiary raids over Tokyo. One of these raids killed about 125,000 people, the other nearly 100,000.

Of the 210 square miles of greater Tokyo, 85 square miles of the densest part was destroyed as completely, for all practical purposes, as were the centers of Hiroshima and Nagasaki; about half the buildings were destroyed in the remaining 125 square miles; the number of people driven homeless out of Tokyo was considerably larger than the population of greater Chicago. These figures are based on information given us in Tokyo and on a detailed study of the air reconnaissance maps. They may be somewhat in error but are certainly of the right order of magnitude.

Was Japan already beaten before the atomic bomb? The answer is certainly "yes" in the sense that the fortunes of war had turned against her. The answer is "no" in the sense that she was still fighting desperately and there was every reason to believe that she would continue to do so; and this is the only answer that has any practical significance.

General MacArthur's staff anticipated about 50,000 American casualties and several times that number of Japanese casualties in the November 1 operation to establish the initial beachheads on Kyushu. After that they expected a far more costly struggle before the Japanese homeland was subdued. There was every reason to think that the Japanese would defend their homeland with even greater fanaticism than when they fought to the death on Iwo Jima and Okinawa. No American soldier who survived the bloody struggles on these islands has much sympathy with the view that battle with the Japanese was over as soon as it was clear that their ultimate situation was hopeless. No, there was every reason to expect a terrible struggle long after the point at which some people can now look back and say, "Japan was already beaten."

A month after our occupation I heard General MacArthur say that even then, if the Japanese government lost control over its people and the millions of former Japanese soldiers took to guerrilla warfare in the mountains, it could take a million American troops ten years to master the situation.

That this was not an impossibility is shown by the following fact, which I have not seen reported. We recall the long period of nearly three weeks between the Japanese offer to surrender and the actual surrender on September 2. This was needed in order to arrange details of the surrender and occupation and to permit the Japanese government to prepare its people to accept the capitulation. It is not generally realized that there was threat of a revolt against the government, led by an Army group supported by the peasants, to seize control and continue the war. For several days it was touch and go as to whether the people would follow their government in surrender.

The bulk of the Japanese people did not consider themselves beaten; in fact they believed they were winning in spite of the terrible punishment they had taken. They watched the paper balloons take off and float eastward in the wind, confident that these were carrying a terrible retribution to the United States in revenge for our air raids.

We gained a vivid insight into the state of knowledge and morale of the ordinary Japanese soldier from a young private who had served through the war in the Japanese Army. He had lived since babyhood in America, and had graduated in 1940 from Massachusetts Institute of Technology. This lad, thoroughly American in outlook, had gone with his family to visit relatives shortly after his graduation. They were caught in the mobilization and he was drafted into the Army.

This young Japanese told us that all his fellow soldiers believed that Japan was winning the war. To them the losses of Iwo Jima and Okinawa were parts of a grand strategy to lure the American forces closer and closer to the homeland, until they could be pounced upon and utterly annihilated. He himself had come to have some doubts as a result of various inconsistencies in official reports. Also he had seen the Ford assembly line in operation and knew that Japan could not match America in war production. But none of the soldiers had any inkling of the true situation until one night, at ten-thirty, his regiment was called to hear the reading of the surrender proclamation.

Did the atomic bomb bring about the end of the war? That it would do so was the calculated gamble and hope of Mr. Stimson, General Marshall, and their associates. The facts are these. On July 26, 1945, the Potsdam Ultimatum called on Japan to surrender unconditionally. On July 29 Premier Suzuki issued a statement, purportedly at a cabinet press conference, scorning as unworthy of official notice the surrender ultimatum, and emphasizing the increasing rate of Japanese aircraft production. Eight days later, on August 6, the first atomic bomb was dropped on Hiroshima; the second was dropped on August 9 on Nagasaki; on the following day, August 10, Japan declared its intention to surrender, and on August 14 accepted the Potsdam terms.

On the basis of these facts, I cannot believe that, without the atomic bomb, the surrender would have come without a great deal more of costly struggle and bloodshed.

Exactly what role the atomic bomb played will always allow some scope for conjecture. A survey has shown that it did not have much immediate effect on the common people far from the two bombed cities; they knew little or nothing of it. The even more disastrous conventional bombing of Tokyo and other cities had not brought the people into the mood to surrender.

The evidence points to a combination of factors. (1) Some of the more informed and intelligent elements in Japanese official circles realized that they were fighting a losing battle and that complete destruction lay ahead if the war continued. These elements, however, were not powerful enough to sway the situation against the dominating Army organization, backed by the profiteering industrialists, the peasants, and the ignorant masses. (2) The atomic bomb introduced a dramatic new element into the situation, which strengthened the hands of those who sought peace and provided a face-saving argument for those who had hitherto advocated continued war. (3) When the second atomic bomb was dropped, it became clear that this was not an isolated weapon, but that there were others to follow. With dread prospect of a deluge of these terrible bombs and no possibility of preventing them, the argument for surrender was made con-

vincing. This I believe to be the true picture of the effect of the atomic bomb in bringing the war to a sudden end, with Japan's unconditional surrender.

If the atomic bomb had not been used, evidence like that I have cited points to the practical certainty that there would have been many more months of death and destruction on an enormous scale. Also the early timing of its use was fortunate for a reason which could not have been anticipated. If the invasion plans had proceeded as scheduled, October, 1945, would have seen Okinawa covered with airplanes and its harbors crowded with landing craft poised for the attack. The typhoon which struck Okinawa in that month would have wrecked the invasion plans with a military disaster comparable to Pearl Harbor.

These are some of the facts which lead those who know them, and especially those who had to base decisions on them, to feel that there is much delusion and wishful thinking among those after-

the-event strategists who now deplore the use of the atomic bomb on the ground that its use was inhuman or that it was unnecessary because Japan was already beaten. And it was not one atomic bomb, or two, which brought surrender; it was the experience of what an atomic bomb will actually do to a community, *plus the dread of many more*, that was effective.

If 500 bombers could wreak such destruction on Tokyo, what will 500 bombers, each carrying an atomic bomb, do to the City of Tomorrow? It is this deadly prospect which now lends such force to the two basic policies of our nation on this subject: (1) We must strive generously and with all our ability to promote the United Nations' effort to assure future peace between nations; but we must not lightly surrender the atomic bomb as a means for our own defense. (2) We should surrender or share it only when there is adopted an international plan to enforce peace in which we can have great confidence.

NUREMBERG IN RETROSPECT

by CHARLES E. WYZANSKI, JR.

1

In the April *Atlantic Monthly* I raised doubts as to certain aspects of the then uncompleted Nuremberg trial. Since that time I have had a chance to profit from comments of Mr. Justice Jackson, Professor Sheldon Glueck, Professor Max Radin, Professor Lon Fuller, an anonymous contributor to the July, 1946, *Law Quarterly Review*, and other writers; I have also read reports of the trial and have studied a summary of the judgment. This further investigation has led me to resolve some of my earlier doubts, and I hope that if I state my own change of views I may contribute to the thinking of others who are concerned about the great questions raised by this trial.

The doubt which seemed to critics of the Nuremberg trial most fundamental was whether the defendants could properly be held to answer a charge that they had engaged in "the crime of aggressive war." Was there any such substantive offense?

Many who replied affirmatively contended that "the crime of aggressive war" was no different from

the specific war crimes (such as killing a captured enemy civilian) that had been defined in the Hague Convention of 1907. That is, they argued that waging an aggressive war was a crime that had been outlawed by a specific treaty or treaties; and that individuals who engaged in such conduct, like individuals who engaged in the slaughter of captured civilians, were triable by any tribunal established for the occasion by a warring power, and were punishable by any penalty prescribed for the occasion by that power.

That argument seems to me unsound. It does not seem to me that an examination of the pre-war treaties, conference proposals, diplomatic correspondence, and juristic writings shows that there was a specific international covenant that individuals who waged an aggressive war were criminals in the same sense that there was a specific international covenant that individuals who killed captured civilians were criminals.

But it is not sufficient to stop with that purely analytical approach. There remains this inquiry: Is it just to declare, after hostilities have begun, that planners of an aggressive war are criminal?

Those who believe that it is, make a twofold contention. First, they say that when these defendants planned this war both they and everyone else would

In the *Atlantic* for last April CHARLES E. WYZANSKI, JR., Judge of the U.S. District Court for Massachusetts, expressed his doubts about the validity of the Nuremberg trial. In the interval his misgivings have been cleared away for reasons as forthright as they are conscientious.

January 19, 1953

Dear Mr Murray:

I read your letter of the sixteenth with a lot of interest.

I rather think you have put a wrong construction on my approach to the use of the Atomic bomb. It is far worse than gas and biological warfare because it affects the civilian population and murders them by the wholesale

Some time or other I'll be glad to sit down and talk the matter over with you.

Sincerely yours,

Honorable Thomas E Murray
Commissioner
Atomic Energy Commission
Washington 25, D C.



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

January 16, 1953

Dear Mr. President:

I note in your Farewell Address to the Nation last night in ending your comments on preventive war you said, "Starting an atomic war is totally unthinkable for rational men."

Having thought long and I believe profoundly about this matter of atomic warfare, I would like to take the liberty of expressing a few thoughts which your remarks evoked in my mind. I gathered from the above quoted sentence and its context that you believe that atomic weapons are in a moral category separate from so-called conventional weapons and perhaps separate from biological and chemical methods of warfare. This distresses me especially since it coincides with what I believe to be the invalid reasoning of the Russians.

I think too that your remarks on this subject may lead the people to a confused concept of the morality of atomic warfare. In a sense we started atomic warfare in 1945 and we believed and still believe that in doing so we were not committing an immoral act. To my mind the only change today from 1945 is in the fact of Russian power to retaliate. I am sure you will agree that the morality of an act should not depend upon how power happens to be distributed.

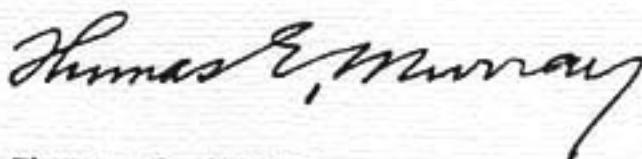
Then again I got the impression from your remarks that the United States was morally foreclosed from taking preventive atomic measures even "in extremis" for example if we knew that Russian submarines were heading for our seacoasts to lob atomic missiles at our major cities.

I feel fairly sure that you intended to give no such impressions as I have mentioned above. I only saw the text of your remarks after they had been given to the press and I regret that I could not have urged these thoughts upon you earlier. It occurs to me, however, that you might want at some future opportunity to make some clarification of the measure of confusion which came to my mind and I believe to the minds of a great many people who are thinking seriously and continuously about this problem. Surely your utterances on this subject will carry great weight with public opinion in the years to come.

B

Let me repeat my sincere gratitude for the privilege of serving under your courageous leadership and my best wishes to you for the coming years of relaxation from the cares of your long public service.

Respectfully yours,



Thomas E. Murray
Commissioner

The President

The White House

B F 1



December 12, 1946

My dear Mr. Bohnen:

I appreciated very much your letter of December second and thank you for suggesting to Mr. Mayer of M.G.M. that I become a movie star. In the first place I haven't the talent to be a movie star and, in the second place, I am sure you will do the part creditably.

The only objection to the film, as it was, was that it appeared to have been a snap judgment program. It was anything but that - the use of the atomic bomb was deliberated for long hours and many days and weeks, and it was discussed with the Secretary of State, the Secretary of War, the Secretary of the Navy and the General Staff of the Allied Armies, as well as with Mr. Churchill and Mr. Attlee.

When it was finally demonstrated in New Mexico that the operation of the bomb was a successful one, it was decided to give the Japanese ample warning before the bomb was dropped. I have no qualms about it whatever for the simple reason that it was believed the dropping of not more than two of these bombs would bring the war to a close. The Japanese in their conduct of the war had been vicious and cruel savages and I came to the conclusion that if two hundred and fifty thousand young Americans could be saved from slaughter the bomb should be dropped, and it was.

A survey was made and the cities on which the bombs were dropped were those which were devoted almost exclusively to the manufacture of ammunition and weapons of destruction.

As I said before, the only objection to the film was that I was made to appear as if no consideration had been given to the effects of the result of dropping the bomb - that is an absolutely wrong impression.

Sincerely yours,

HARRY S. TRUMAN



Mr. Roman Bohm
10537 Valley Spring Lane
North Hollywood, California



B

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United States Senate

RECEIVED
30 DEPT. OF STATE
COMMITTEE ON
POST OFFICES AND POST ROADS

September 27, 1945

The President,
The White House,
Washington, D. C.



My dear Mr. President:

Enclosed you will find my views on the atomic bomb,
as requested by you.

With much respect,

Sincerely your friend,

Kenneth W. Teller

The question immediately submitted was whether we should give to Russia our formula for making the atomic bomb, it being seemingly understood that we were going to give this formula to Great Britain and to Canada because Great Britain had furnished twenty-five or thirty workers or scientists who aided us in the program, and because we wanted to retain Great Britain's good will, and because Canada had furnished the uranium but of course at an enormous price.

It seems to me unwise, impolitic and dangerous to our nation's defense, provocative of war, and dangerous to peace, to give this formula to Russia, England, Canada or to any other nation.

In passing, I want to say that I have not a single unkind feeling towards Russia or the Russian people. I think both Russia and the people made a wonderful record in the late war. She fulfilled every obligation not

only in the war against Germany but it will be remembered when many people thought she was not obligated at all to go into the war with us against Japan, and that it was not to her interest to do so, yet she came proudly across and stood with us in that war. I repeat I have not anything but the highest respect and admiration for the Russians.

It is on their account indeed that I take the stand that if we give this formula to England or Canada we are in duty bound and in honor bound to give it to Russia and to China and our other Allies also.

I am going to try succinctly to give my reasons why this bomb, or the formula for making it, should not be given away to other nations:

- (1). Russia as a government nor as a people did not give us material aid in discovering this formula and, therefore, is not entitled to the use of it or property rights in it on this account.

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- (2). Great Britain or Canada did not give us any material aid in discovering this bomb, though I have been reliably informed that twenty-five or thirty British citizens, the most of them scientists, were over here and helped in one way or another with it, and surely the work of twenty-five or thirty scientists or helpers would not entitle her to a property right in this bomb.
- (3). This help from Great Britain was so inconsequential, and her own self defense was so much at stake, a thousand fold more than ours, that surely she could not claim a property interest in the formula of the bomb by the casual assistance of twenty-five or thirty people in a two billion six hundred million dollar (\$2,600,000,000) enterprise.
- (4). America, as I am informed, spent two billion six hundred million dollars (\$2,600,000,000) on this bomb. At best, Great Britain spent not more than a few hundred thousand dollars on it and her interest in her own defense was so much greater at the time than our interest in our defense that surely she could not claim a property right in this bomb.
- (5). I think anyone could see that Canada having for the first time made real money out of uranium which she sold us for the purpose of making the bomb would not be entitled to any consideration in the property.
- (6). Neither Russia nor China nor any other Ally furnished anything towards creating the formula.
- (7). Even if there were any equity why it should be given to any other nation this is not the time to give it away. We do not ourselves know the value or worth of this formula at this time. It is too early yet for us to ascertain its value or worth and surely we ought not to give this formula away at this time.
- (8). This formula may or may not be important industrially as well as in a military way. It may wholly revolutionize the use of force and power in this nation and, therefore, it should not be given away to any one for any purpose until we know its value and worth.

B R

(9). We have not the constitutional nor the moral nor the legal right to give this away without return and as we do not know its value it surely should not be given away now.

(10). From a military standpoint, from actual experience with it, it is the greatest military power or force in the world today and, therefore, it may be and probably is the greatest foe of peace and the greatest promoter of war ever known in the world.

(11). Every nation great or small and ambitious for other nations' territory, whether a defeated or a victorious nation in this war, upon becoming the owner of this formula will at once become imbued with the ambition that with the use of this formula they can acquire other nations' property and thereby increase the likelihood of war.

(12). But it is said that all except our late enemy nations have united in an agreement to keep the peace and that is true, but I call attention to the fact that in the first world war we signed peace agreements with practically all the nations to keep the peace in the future and the ink had hardly gotten dry on those peace treaties before many nations were already plotting for another war. This was especially true of Germany and Japan.

(13). The United States wants no other nation's property and wants no other nation's territory. We simply want to live in peace with all of our neighbors and trade and traffic and have good relations with all. This is not true of other nations as shown by their history. The only safe trustee of this formula is the United States.

(14). We feel kindly towards our Allies, those that we helped and those that we did not help, though for the moment I cannot think of any that we did not help. They owe us. We do not owe them.

(15). But it is claimed that our Allies or the most of them do not feel kindly towards us and that it is especially necessary that we create in Great Britain, France, Russia and other Allies a most kindly feeling towards us and for that reason we should be generous and give them property of this kind. If the United States having entered this war just before Hitler was about to capture

London, and of course he would have then captured the entire nation, and was only kept from doing so by the timely entrance of the United States in the war; if we could not by giving her some twenty odd billions of dollars in lend lease purchase her good opinion of us; if we could not after saving her government and people from German rule at the expense of two hundred and seventy-five billions of dollars to us purchase England's good will, I cannot believe that we could purchase it by giving in addition the use of this formula which may be the most important formula ever written in both a civil and military way.

(16). Likewise Hitler had overrun Russia. He had the Russian Army beaten back to Stalingrad practically to the Asiatic line then we came in by lend lease, by sending her guns, ammunition, tractors, aeroplanes, food and clothing way around by the Persian Gulf and the North Sea, all free and for nothing, and if that did not purchase Russia's good will there is no amount we could give her or no property we could give her that would purchase her or her country's good will. This applies in lesser degree to all countries.

(17). Given such a dangerous weapon or the formula for it, each and every nation will at once get their scientists busy with it and the most of them will think they have improved it in a better and more effective way than any other nation and it won't be long before they will want to go to war to prove that they have got the best bomb in the world and, unless they change their past thousand years history, a war of bombs will soon be fought. To give the formula for this weapon to other nations or to any other nation without money and without price would be to invite them to get busy and prepare for another world war.

(18). It is argued that Great Britain has all the information now necessary to proceed with the formula and build bombs. If that is true there is no necessity whatsoever in our giving her the formula. If we give it to Great Britain I do not see how we can keep from giving it to Russia and all the other Allies.

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(19). My sincere and honest and genuine judgment is that the distribution of this formula to our Allies will again disturb the peace of the world; undo all the good work we have done at San Francisco, and war will be eagerly looked forward to again by all the war-like nations of the world.

(20). I believe for peace-loving America to keep the formula and the process in her own hands will guarantee the peace of the world as outlined at San Francisco.

K. McK

B F

DEPARTMENT OF AGRICULTURE
WASHINGTON

RECORDED IN INDEX
September 25, 1945

The President
The White House

Dear Mr. President:

You have asked that members of the Cabinet give you suggestions as to what your course should be in connection with the disposition of the secret of atomic energy. I understand that this is distinct from revealing to any of our allies, other than those who already know it, the secret of the manufacture of the atomic bomb.

I can only repeat the suggestions that I made in the Cabinet meeting, namely that I do not feel that we are under any obligations at this time to reveal commercial secrets such as the secret of atomic energy, nor are we under any obligations to reveal a military secret developed independently by the United States, United Kingdom, and Canada, at a cost of at least \$2,600,000,000 to the United States.

I listened carefully to the testimony that the Russians might be able to make an atomic bomb in five years. I have my own doubts about this. It is not a question of cold science, or the application of certain mathematical laws. We know that in the production of the atomic bomb there was a certain element of American mathematical and mechanical genius which has given us the automotive industry, the great development of the telephone industry, and countless other inventive processes which are not always developed in every land, and which seem to be peculiarly the result of long years of mechanization of industry within the United States. I quoted to you those lines from Kipling which suggested that they had copied all they could copy, but they couldn't copy our minds.

We need to remember that the Russians have known how to make automobiles, they have known all the trade secrets of the automobile, yet today they have to depend upon us for the machine tools, the equipment, the "know-how," to turn out trucks, tanks, and automobiles in sufficient numbers to see them through a mechanized war.

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2-The President, The White House



Let me remind you also that the Russians have been skillful in the knowledge of the airplane, and yet it was our planes which they needed in great numbers to defend their country. It isn't just a question of turning over to them a mechanical formula; there needs to be certain types of evidence that they possess the genius to apply these laws in a manufacturing process before they can ever make from the knowledge of atomic energy a proper atomic bomb.

I was, of course, greatly interested in the moving statement of the retiring Secretary of War, Mr. Stimson. I appreciate his fine qualities; he is truly a great man, and I respect him for the long and distinguished service which he has rendered to the American people. At the same time, I am not willing to accept his statement that Russia has steadfastly been our friend, and that, therefore, we should not hesitate to turn over to Russia the secret of this bomb. I would ask him who saw Russia from the inside and understood its military secrets during the war. We opened up a great many of our things to Russia, and when we finished the war we were almost as much in the dark as to what Russia was doing, what Russia was planning, as the day we entered it on their side.

If the Russians did not trust us in time of war when we were their allies and when we were standing by their side protecting their homeland as they were under invasion, what reason do we have to believe that they would be our friends in time of peace when they were in no particular danger?

I think we need to remember the story of 1921 and 1922. We were persuaded to sell our battleships after a former war. We did it in the cause of peace. Did we get peace? No, we got a 5-5-3 ratio, with the British and the Japanese, and when the time came under President Roosevelt to start our program of rearmament, we found that the 5-5-3 ratio did not apply; that England had a greater navy than we had; that Japan, whose ratio number was 3, had a greater navy than we had, and we began to rebuild from an inferior position rather than from a position of equality. We ought not to make that same mistake twice in succeeding generations. Has Russia always been friendly? Was she friendly when she signed a neutrality pact with Hitler when the back of civilization itself was against the wall? I would remind you that



3-The President, the White House

that pact was broken by Germany in its lust for further world conquest. It was not broken by Russia in fervor of her zeal for the democratic nations. Russia was quite content to see Germany sweep over every small nation in Europe, and never raised a finger until Hitler invaded its own homeland. Then Russia became indignant against the Nazis and against the principles of the Nazi State. But as long as she was getting her swag in Poland, as long as she was immune from attack, Russia saw nothing wrong in the entire program of the Nazi government. I want our country to remember that, when Russia now wants a part of the atomic bomb.

And then I think I would ask this question of the War Department; why didn't the War Department gamble on Russia while it was developing the bomb? Why didn't we take Russia into our confidence while we were doing the actual work in connection with the development of atomic energy? The answer is we could not trust Russia when she was our ally in the war. I wonder why we feel we can trust her when she is our competitor in the peace. But the great and to me the persuading argument is the feeling of the American people. Some how I cannot help but feel that the people, in their instinctive trust of certain people and distrust of certain others, usually have about the right answer. They do not know all the reasons, but they come out with some surprisingly good answers. In this particular instance, I think I can say to you that every person I talked to in the two weeks that I was in New Mexico felt that the United States should not at this time release to the Russians the secret of atomic energy or of the atomic bomb.

I got still more convincing proof while I was at Decatur, Illinois, making a speech to the combined Chamber of Commerce and the Farm Bureaus. It was a splendid banquet, with some 675 people drawn from every section of Illinois. I made it my point to ask every person I could get to what his opinion was on the question of how far we should go toward releasing the bomb, or the secret of atomic energy, to Russia. The answer was completely unanimous. I did not meet a single person who thought that Russia should be given any part in this secret. I did not meet one single soul who believed that we should now be frank to Russia when they recognized that Russia, throughout the period of the war, had not been frank with us. To be sure, they wanted us to get along with Russia, but not at the cost of revealing to them the secret of atomic energy.

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Now my point is this: the President is the leader of the American people. You have a responsibility to all classes of people in the United States. You now have their complete confidence. It is astonishing to people all over this country the development of support which you have from all classes. Republicans, as well as Democrats, tell me on the streets, and write me letters to say, that they trust you, and that they are delighted with the way you are going. I think you have a responsibility to hold that trust by whatever means is necessary. I think you are obligated to do those things that will preserve the confidence of the American nation in its present Executive, even though some of the things you have to do may run slightly against your judgment as to the wise thing over a course of a hundred years. It is one thing to plan wisely for a hundred years; it is another thing to steer this government and its world associations safely through the period of the next ten or twelve years when many of the nations of the world will be in ferment.

I am not satisfied with conditions in France. I am not happy over the development of certain political sentiments in many lands. I think, however, that those people have a right to the selection of the type of government that they may prefer. But somewhere in this world there needs to remain some of those strong ~~quarantine~~ qualities of government and of representative government which we in America delight to point to as flowering best within our own land. As long as you hold the confidence, love, and respect of the American people, you can persuade them to take their part in a United Nations organization. You can persuade them to assume their share of necessary monetary and economic reform. You can persuade them to sacrifice ~~at~~ their stocks of food in order to prevent chaos and anarchy in the world. But the day they think you are slipping; the day they believe you are yielding to Russia on important matters like the atomic bomb, then you are likely to sacrifice some degree of their confidence and respect, and you might eventually be sacrificing enough so that you no longer could successfully lead the American people into the proper paths in the years that come. B

That is my big and abiding concern. I think it far out-shadows the importance of getting on with Russia in the next few months. After all, primarily, you are the Executive of the American people. Your responsibility is solely to this nation, and as long as you can hold its confidence, I believe you are assured of eventual success, not

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only for your programs, but for the programs which have been
fostered by this nation over a long period.

Respectfully yours,

Leonard Phuderson
Secretary



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The Axis in the Mediterranean

Second instalment of an essay by Vice-Admiral Weichold, former German commander in the Mediterranean. Slightly condensed from the original. Restricted.

About August 22, 1941, the Italian fleet met the offensive sweep of the Gibraltar squadron to the east by cruising to the east and south of Sardinia. It must be regarded as the greatest misfortune for the Italian Navy that this first large-scale operation under the new active leadership of Admiral Sansonetti should have had no success. The main responsibility for its failure to make contact and engage the enemy lay with the Italian aerial reconnaissance units. This again bore out the oft-repeated opinion of the German Admiral that the withdrawal of the German air corps would make the execution of the Mediterranean war at sea very difficult; apart from the value of the active support given by the Luftwaffe to the land warfare in North Africa during the month of August. Tobruk, the harbor installations of Alexandria, Suez and the Suez Canal itself were successfully attacked. The direction of the Mediterranean war, however, suffered as a whole from the failure of cooperation between the two forces indispensable to each other, namely the Italian fleet and the Italian air force. The air force would not regard itself as involved in the war at sea and refused to serve its interests.

Between the 25th and 29th of September another British break-through took place in the Sicilian channel. The Italian Navy met with reverses similar to those of the 22d-24th of August. The Italian fleet, including two modern capital ships, was on the afternoon of the 27th of September east of Sardinia. As the British squadron had at its disposal more than two aircraft carriers, the Italian Commander-in-Chief avoided an engagement. Again, the lack of a powerful Italian Fleet Air Arm and the withdrawal of the German Air Force from Italy had a decisive effect. The shadow of the tragic battle of Matapan, during which the Italian naval forces had felt the same deficiency, was ever before the eyes of the Italian leaders. Only an operational and tactical collabora-

tion with the German air corps could have altered the situation. All proposals then made by the German Admiral for the use of the German air forces in the Mediterranean sea warfare were turned down by the Luftwaffe.

Axis Shipping Losses

In 1941, the first real effects of the increased shipping losses were noticeable in the shipping space available. It was no longer possible for all convoys to include ships loaded with heavy material. This caused a remarkable decline in the facilities for the transport of heavy vehicles. The German admiral had on the 18th of August already pointed to this shortage of shipping space and asked for help.

"... Apart from the possible mounting of an offensive in this theater, which owing to the geographical situation would necessarily increase the demand on transport, the mere maintenance of the military forces overseas requires more tonnage than will be available in the future if the present rate of losses continues. An appreciable decrease in losses is in no way to be reckoned with. Thus, from a military point of view, it is of the utmost necessity that the question of building new ships to replace the losses should be investigated, especially in the case of Italy. Moreover, the speediest methods of production should be sought so that there shall be no vacuum endangering the present theaters of war or becoming a serious hindrance to future operations. This problem is a joint German-Italian concern of a military nature and of the utmost urgency."

As with all German-Italian problems, this one was neither solved nor dealt with effectively.

In October another hindrance to the Italian direction of the war at sea became apparent in the increasing shortage of fuel oil stocks. Since February 9, 1941, the German admiral had often

and its special twin turret mount. The lighter weight of these new guns and mounts permitted designing the *Didos* to carry 10 guns, eliminated the necessity for a special heavy A. A. secondary battery, and provided for favorable arcs of fire. Due to the urgent need for shore A. A. batteries in the defense of British cities during the German aerial assault of 1940-41, not all of these cruisers received their full armament. Two were fitted out with an alternative battery of eight 4.5" shield guns, while the later *Dido's* were altered to take only eight 5.25 pieces, though this was offset by more close-defense weapons. Eleven of these vessels have raking stacks and masts and generally resemble the *Southampton*, while the last five were given a lower profile and upright stacks and masts. This class suffered the severest war losses of any British cruiser type, mute testimony to their extensive war record. Only 11 of the original 16 *Didos* are available today.

The oldest cruisers scheduled for retention in the post-war fleet are ten heavy or 8-inch-gun cruisers, popularly known as the "County" class as they are named for counties of the United Kingdom. They are built to three separate designs, but all are so similar that differentiation is only called for in a minute analysis of their characteristics. Thirteen were provided for the Royal Navy and two for the Australians under the construction programs following the first World War; of these, two were cancelled under agreements reached at the London Naval Conference of 1930. Averaging around 9,900 tons standard displacement, 31.5 de-

signed speed, and mounting a main battery of eight 8-inch guns in twin turrets, these ships were primarily designed for long periods of cruising involved in protecting outlying commerce lanes and hunting down hostile raiders. They are fine weatherly ships, with excellent seagoing qualities, and although they do not compare favorably, on paper, with heavy cruisers evolved by other navies, they have performed very well on all occasions. Three of these, including the Australian *Canberra*, were lost during the war; another, the *London*, was modernized along the lines of the *Fiji*'s superstructure design. The remaining ships are characterized in appearance by three tall thin stacks, a minimum of superstructure and high freeboard hulls. Certain units sacrificed the third 8-inch gun turret during the latter stages of the war in order to obtain increased A. A. armament. As the Admiralty have shown little interest in 8-inch gun cruisers since 1932, and in view of the age of this group of cruisers, it is probable that the "Counties" will be among the first larger warships to be disposed of upon replacement by future construction.

A number of World War I cruisers, ranging from the 9,800-ton, 7.5 gun *Hawkins* to the small "C" and "D" class cruisers still exist at the moment. All are slated for early disposal on account of age material condition and obsolete design, and warrant no further mention in this survey.

(The destroyers, submarines, and other craft of the British Navy will be discussed next month. An article on British naval aircraft is in preparation.)



H. M. S. *London* is the only British heavy cruiser given a modernization to date. A new style block-bridge and re-trunking of the boiler uptakes into two upright stacks replaced the old open bridge and three raking thin stacks. She can be distinguished from the *Fiji* class by a flush deck hull and twin turrets.

New York, the teacher told me that before I could learn to drive the car I must first learn how to stop it. Before Tojo the cabinet breakers were always *Ronin*, Samurai without any master. They have played a particularly important role in Japanese history, and always they have been connected with the military. Under Tojo, all the *Ronin* were pledged to him because he was the military's man. Under Tojo they obeyed him.

Of course, I could not indulge in any propaganda against Tojo, because I was in the Cabinet, but I believe that Okada and I were the center of the opposition to Tojo. It took just 1 year to do it.

You may wonder why Okada disliked Tojo so I shall tell you the story. Before the war Tojo gathered together all the former Prime Ministers and explained why he was going to start the war. Okada, [Adm. Mitsumasa] Yonai, and [Baron Reijiyo] Wakatsuki did not agree. Okada asked Tojo about the condition of Japan's merchant shipping. Tojo explained that we might lose 80,000 tons per month, and I don't remember the exact amount of new construction he mentioned but it was by his calculations more than enough to make up for what was lost. Okada said his estimate was wrong. And the fact was that Okada was right. It was as he said. We lost, well, maybe 300,000 or 200,000 tons per month. Our capacity for building was 500,000 tons, but we couldn't build that much because we soon didn't have the materials. There were many, many shipyards which were idle during the war for this reason. So Okada says that Tojo is a liar. No, that is not the word, that he has no sense for estimating the future.

Q. You said a few minutes ago that it took just a year to accomplish your project against Tojo. I wonder if you would give us the story of what happened in that year?

A. First we talked to [Marquis Koichi] Kido (Lord Keeper of the Privy Seal) because he could nominate the Prime Minister. Of course, the Emperor formally nominated him, but it was Kido who actually did it. And we sent word to Tojo, that it would be best for him to resign. Tojo decided to reconstruct his cabinet because Mr. Kishi [Shinsuke Nobusuke Kishi, Minister of Commerce and Industry] and [Mamoru] Shigemitsu came over to our side. This was just before the Marianas campaign. Tojo asked Yonai to be Minister without portfolio. Okada called a meeting of the former Prime Ministers, and they decided that Yonai should not enter the Tojo government, so Tojo was compelled to resign. General

Abe accepted his invitation, but Tojo could not stand up against the solid opposition of the former Prime Ministers.

Okada tried to get them to build a Cabinet of peace-minded people, and the Army fought against it. Koiso was an old soldier, but outside of the government he had been very critical of Tojo, so we expected that Koiso might do something, but he was not strong enough to fight the military. I think it was a pity that Koiso ever came in as Prime Minister.

Then Suzuki was appointed. His nomination meant a change in the tendency of operation of the government. The Emperor for the first time could express his own opinion, I think. Many of the lower officials of the government, like me, had had official conferences in which we might say something like, "How can we continue the war without steel?" Next day the Kempei would come to my office and say "We hear that at a meeting last night you expressed doubt of final victory." All were afraid of the Kempei.

Well I came to the conclusions I have told you about before, and Suzuki decided I was right. He went to the Emperor and came back a short time later. He said to me that we must start some steps toward peace. This was in the middle of May. So we asked Hirota, Koki [former Prime Minister] to speak with the Russian Ambassador [Joseph Alexandrovich] Malik in private conversation. He did so on several occasions, sounding out the Russian attitude toward interceding with America. In the beginning it looked as we might be successful, but the talks never reached a successful conclusion. In May Germany collapsed, as you know, and after that the War Minister [Gen. Korechika Anami] asked the Cabinet for a conference in the presence of the Emperor to decide the fundamental principle of the war—whether to continue it or not. Of course, we [laughing] had had many rehearsals of that meeting.

The military insisted upon continuing, but I and others had different ideas, although we couldn't actually advocate the stopping of the war because the MP's were still around. I drafted the memorandum for the conference, and I started it with the statement that we should try to accomplish the war and keep the Emperor's reign intact and keep the home land. Of course, the military read the word accomplish as meaning that the war should be continued, but it was followed by the details which I had collected for my report to Mr. Suzuki. The whole thing was presented to the conference in the presence of the Emperor. Those attending were

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the Prime Minister, the war Minister, the Navy Minister [Yonai], the Army Chief of Staff [Gen. Yoshijiro Umezawa], the Chief of the Navy General Staff [Admiral Soemu Toyoda], and the Foreign Minister [Shigenori Togo]. Each expressed his own opinion, but none expressed his real feelings. But if you read the details of my memorandum, it is clear that the war had to stop. The Emperor himself read the report as well as the others. This was on the ninth of June. At that time the Emperor said nothing.

On the 20th of June the Emperor, by his own will, called a meeting of the Prime Minister and the others I just mentioned who were in the meeting of June 9th. (At this point S. explained that the Cabinet had to present a written request for permission to hold a conference in the presence of the Emperor, but the Emperor could call one at his own initiative at any time, although he rarely did so.) The Emperor told them that the conclusion in the document presented in the conference of June 9th seemed to be very paradoxical. He knew the real meaning of the conclusion. He said, "I think it is necessary for us to have a plan to close the war at once as well as one to defend the home islands." (S. explained that at that time the Army was making much of its plan to defeat the American forces when they landed on the home islands.)

As a result of this expression by the Emperor, Suzuki decided to stop the war. After the meeting, when Mr. Suzuki came back, he said to me, "Today the Emperor said what everyone has wanted to say but yet was afraid to say."

Q. What was the reaction of the military to this decision?

A. Yonai understood and approved the idea. The War Minister, Anami, also approved, but he could not express his real feelings of the generals around him and the fear of assassination.

After that the government decided to send Prince Konoye to Russia and asked Russia if he would be persona grata. The Russians said that they could not decide on the matter unless they received from the Japanese government an expression in more detail of the purpose of the Prince's mission. We sent a cable to Ambassador (Naotake) Sato in Moscow to explain the mission, as follows:

1. To make an improvement in relations between Russia and Japan (this in view of the recent denunciation of the Neutrality Pact).
2. To ask the USSR to intercede with the United States in order to stop the war.

The Russian answer was that Stalin and Molotov were just leaving for the conference at Pots-

dam, so an answer to the Japanese request could not be given until they returned. We wanted an answer before the conference, but we just couldn't have it, so there was nothing to do but wait.

Suzuki and I felt quite pessimistic about the Russian attitude toward our proposal. Then on June 26th came the Potsdam Declaration. Suzuki, Togo, and I talked together, and we felt that this declaration must be accepted as the final terms of peace (surrender), whether we liked it or not. Still the military side of the government said that the terms of the proclamation were "too dishonorable."¹

On the 7th of August, early in the morning, about 2 o'clock, the bell rang beside my bed. (My own house was bombed in April and I moved to my official residence. That was bombed in May, so I moved my bed into my office, and I stayed there 24 hours a day. In the morning when I got dressed, I would put on my hat and walk through the building, return to my office and hang up my hat. That I called coming to the office. At night I would again put on my hat and walk through the building the same way. That was coming home from the office.) When the bell rang beside my bed, it was Domei telling me that President Truman had announced that the atomic bomb had been used at Hiroshima. I already knew that the Hiroshima damage had been very severe and that it had been caused by just one airplane. Everyone said that America had used a new bomb, but they didn't think it was an atomic bomb because our scientists had told us that no country could finish the atomic bomb for use in this war.

The military said that it was probably a 4-ton bomb bursting in the air. They made their calculations, but found that a 4-ton bomb could not do that much damage. They suggested that it might be a 100-ton bomb. After the announcement, we sent some scientists to Hiroshima, and they reported that it was a real atomic bomb.

¹Asked in aside, why the military permitted the approach to Russia, if they were hostile to acceptance of the Potsdam Declaration, Sakomizu replied: "The War Minister (Anami) knew of our negotiations, but he never told his military staff. For that I admire Mr. Anami. And that is why he committed suicide." He continued: "On the outside and officially he pretended that we must continue the war, but inside himself he had made his decision that it must be brought to a stop. He alone could have broken the Suzuki cabinet at any time. It shows his character that he didn't, despite what he knew of our negotiations. Yonai of course, always expressed his idea that the war should be stopped, and that is one way of being a brave man. Mr. Anami was of another."

When this news came in on the morning of the 7th I called the Prime Minister on the phone and reported the announcement. Everyone in the government and even in the military knew that if the announcement were true, no country could carry on a war. Without the atomic bomb it would be impossible for any country to defend itself against a nation which had the weapon.

The chance had come to end the war. It was not necessary to blame the military side, the manufacturing people, or anyone else—just the atomic bomb. It was a good excuse. Someone said that the atomic bomb was the Kamikaze to save Japan.²

Q. How long do you think the war would have continued if the atomic bomb had not been used?

A. We had already asked the Russians to intercede, and we could expect that they would eventually give us some answer. If it had been unfavorable, there was just one way to bring peace and that was to broadcast directly to the United States. But it would have been difficult to find a good chance to do so. I think you can understand. Suzuki tried to find a chance to stop the war and the atom bomb gave him that chance.

I asked the Cabinet Board of Information to put all the information about the atomic bomb in the newspapers and on the radio, in order to tell the people just how fearful it was. But the General Staff Information Office stopped it. They tried hard to emphasize that the people need not fear the atomic bomb if they were in shelters. I had much struggling with the Chief of Military Information. All the Cabinet Board of Information was finally allowed to say was that the atomic bomb had been used at Hiroshima. This item appeared in the morning papers of August 8. Of course, all the intellectuals knew the meaning of the announcement, because there had been so many stories and novels about atomic power. I wanted all the people to understand the meaning of the bomb, but it took a full day just to get the bare announcement released.

On the morning of August 7, Suzuki and Togo [Foreign Minister] conferred and reported the news to the Emperor. They also gave their opinion that this was the chance to accept the Potsdam Declaration. Still the War Minister could not make up his mind, publicly, openly.

Early on the morning of August 9 the bell beside my bed rang again, and Domei reported that Russia had declared war on us. I previously had had a

report from Sato that he was going to meet with Molotov in Moscow at midnight Japanese time on August 8. So I was expecting some sort of news. I felt rather pessimistic about the Russian negotiations, but we didn't expect a war declaration.

I then got the full text of the war declaration. I took it to the Prime Minister at about 5 o'clock in the morning. I told him that there were two ways for the Cabinet to go:

1. They could resign because they had tried for peace through the Russians and had failed.
2. They could take some step of a positive sort.

The Prime Minister said, "If we resign it will take 2 or 3 days for a new cabinet to be formed. The loss of 2 or 3 days is intolerable, since that lapse of time might decide the national destiny. It is necessary for us to take some positive step."

1. To declare war on the Russians and continue the war until the entire nation was destroyed, to the death of the whole nation.
2. To accept the Potsdam Declaration.

Suzuki said he would see the Emperor and he left about 7 a. m. He came back an hour or two later and told me that he decided to accept the second alternative step (Potsdam Declaration) and that the Emperor's ideas were the same. He then ordered me to take the necessary procedures, to make the proper arrangements.

It was necessary to hold two conferences:

1. A meeting of the Senso-shi-do, or Inner Cabinet, made up of the Prime Minister, the Foreign Minister, the War Minister, the Navy Minister, the Army Chief of Staff, and the Chief of the Navy General Staff.
2. A meeting of the Cabinet.

The first was held at 10 on the morning of August 9. Ordinarily I, as the Chief Cabinet Secretary, the Director of the Bureau of Military Affairs (Lt. Gen. Masao Yoshizumi), and the Director of the Naval Affairs Bureau (Vice Admiral Zenshiro Hoshino) participated in these meetings. I suggested to the Prime Minister that we three should not be included this time, because if we were, the attending members would not speak freely. Mr. Suzuki agreed. So when all had assembled I took these two out, and we waited in the other room. The important thing here is the fact that I took them out of the room. This had a very significant meaning. Mr. Anami (War Minister) had decided himself inside, but he had to express this decision openly. When I took the

² Meaning that without it the war would have continued until Japan was no more.

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two military assistants out, the War Minister saw what was meant, and it gave him his chance. On the surface this was a negligible event, but it really is not.

The conference lasted for 3 hours. I walked in two or three times, and each time everyone was sunk deep in his chair, and they said nothing. The atmosphere was very gloomy and very cold. Afterwards the Prime Minister came out and told me that two opinions had been expressed and no agreement had been reached.

1. To accept the Potsdam Declaration unconditionally, with the understanding that the Potsdam Proclamation did not include the requirement that the Emperor's legal position be altered.

2. To accept the Potsdam Declaration with the following conditions: First, that the Allied forces would not occupy the home land, excepting the small islands off the coast; second, that the Japanese military and naval forces abroad were to be withdrawn by the Japanese's own will and disarmed and demobilized; third, all war crimes should be prosecuted by the Japanese Government.

Suzuki said that he, Yonai, and Togo were in favor of the first opinion; that Anami, Umezu (Army Chief of Staff), and Toyoda (Chief of Navy General Staff) favored the second opinion.

Then I said, "Let's have the Cabinet conference." He agreed and I arranged it for 1 p. m. Sixteen ministers were in attendance. They were gathered about a big round table. As Chief Secretary, I sat at a small secretarial desk to one side. When the meeting opened, Togo (Foreign Minister) explained the discussion at the Inner Cabinet meeting. About nine members agreed with the first opinion (Unconditional acceptance of Potsdam Declaration), four with the second opinion (conditional acceptance) and three were on the fence. (These took such positions as that the three conditions in the second opinion were too many, that two were enough, that the Prime Minister should take the decision and the rest should follow.) The Cabinet meeting continued until 8 p. m., with one hour out for dinner. Toward the end I wrote a note to Suzuki suggesting that he had better declare an intermission. This he shortly announced.

The Foreign Minister, the Prime Minister, and I then met in the Prime Minister's room, and I told Suzuki that it was apparent that the Cabinet conference was unable to reach a decision. I asked him what he thought we should do. Then he said,

"How about this? Go to the Emperor, report the conferences in detail, and get the Emperor's own decision." I said that it would be better to have an inner Cabinet meeting in the Emperor's presence and let all the members express personally their own views. Suzuki agreed, and I proceeded to make the arrangements.

To hold a cabinet meeting in the presence of the Emperor, it is necessary to prepare a document stating the purpose of the meeting, over the signatures of the Prime Minister, the Army Chief of Staff and the Navy Chief of Staff. I wrote this document and got the signatures. It was taken to the Emperor and he agreed to the meeting.

The conference (with the Emperor) was held at 11:30 p. m. (the Cabinet meanwhile was still at intermission). I read the text of the Potsdam Declaration. It was very hard to do because the words of the declaration are very hard; the contents were not cheerful things to read in the presence of the Emperor. Then the Foreign Minister expressed his opinion, and the other members, all of them, expressed theirs, as in the morning conference. About 3 o'clock on the morning of the 10th, the Prime Minister stood up and made the following announcements: "We have discussed this question for a long time and everyone has expressed his own opinion sincerely without any conclusion being reached. The situation is urgent, so any delay in coming to a decision should not be tolerated. I am therefore proposing to ask the Emperor his own wish and to decide the conference's conclusion on that basis. His wish should settle the issue, and the government should follow it."

(At this point Sakomizu explained very earnestly that this was a very delicate and unusual procedure, since under the constitution the Emperor cannot decide anything by himself, that there is no constitutional procedure for the Emperor to express his wishes in matters of policy, and that the Emperor must always follow the government's advice.)

Suzuki stepped two or three steps away from the Emperor and asked him to express his own opinion. The Emperor just leaned forward and told Suzuki to go back to his seat. The Emperor then started to express his own opinion: "I agree with the first opinion as expressed by the Foreign Minister. I think I should tell the reasons why I have decided so. Thinking about the world situation and the internal Japanese situation, to continue the war means nothing but the destruction of the whole nation. My ancestors and myself have always wished to put forward the nation's welfare and international world peace as our prime concern. To continue the war

now means that cruelty and bloodshed will still continue in the world and that the Japanese nation will suffer severe damage. So to stop the war on this occasion is the only way to save the nation from destruction and to restore peace in the world. Looking back at what our military headquarters have done, it is apparent that their performance has fallen far short of the plans expressed. I don't think this discrepancy can be corrected in the future.¹ But when I think about my obedient soldiers abroad and of those who died or were wounded in battle, about those who have lost their property or lives by bombing in the home land; when I think of all those sacrifices, I cannot help but feel sad. (*Sakomizu said that the Emperor used very heavily emotional words in this part of the statement, and because of them the members of the Cabinet cried openly.*) I decided that this war should be stopped, however, in spite of this sentiment and for more important considerations."

Mr. Suzuki then said, "The Imperial decision has been expressed. This should be the conclusion of the conference." It then was about 3 a. m. on August 10th.

We went back to the Cabinet offices and reconvened the Cabinet meeting. The Prime Minister reported the Emperor's decision. All the members agreed to it and signed the document (advising the Emperor that the Potsdam Declaration should be accepted unconditionally).

I forgot to say that the conference in the presence of the Emperor was attended by (Baron Kiichiro) Hiranuma, President of the Privy Council. This he did at the Emperor's special request. A Privy Council resolution is essential for the ratification of the international agreement, such as the acceptance of the Potsdam Declaration, but there was not time to assemble the full Privy Council. They are old men, living all over the country, and it would have taken a considerable period to assemble them all for a formal session. To save time, I advised the Prime Minister that this should be omitted. So Mr. Suzuki asked the Emperor to call Baron Hiranuma into the meeting. Hiranuma agreed with the first opinion (unconditional acceptance of the Potsdam Declaration), and his agreement was sufficient to constitute acceptance by the Privy Council.

The cable of acceptance was sent early, about 7 o'clock, on the morning of the 11th through the Swedish and Swiss Governments. About 0400 on the 12th we received a broadcast from San Francisco giving us your government's answer, but we did not receive the official written document through the neutral countries until about 0700 on the morning of the 13th.

There was little difference between the broadcast version and the official text. We studied the former the whole day on the 12th, the unofficial document. On the afternoon of the 12th, San Francisco broadcasted that the Japanese reply was very late and intimated that as a result it might be necessary to bomb Tokyo. (Meanwhile we had heard from a prisoner of war, A B-29 pilot, that your government planned to use the atomic bomb on Tokyo on the 12th.) I was very much worried. So I asked Domei to broadcast that the Japanese government had not yet received the official reply of the American Government. This broadcast was stopped by the military on the grounds that they were afraid the military forces abroad would pick it up, guess that something was going on, and the effects on morale would be serious. The military refused to permit Domei to send anything. I was very afraid of the possibility that the atomic bomb would be used against us again. So on my own responsibility I told Domei to make the broadcast despite the military.

That was about 5 p. m. Fifteen minutes later San Francisco said that they could understand why the Japanese reply was late. Immediately thereafter several high officials of the military came to me and asked me why I had told Domei to issue this broadcast. They had been to the Domei officials and had been told that I had ordered the broadcast despite the military objections and would take complete responsibility. This conversation was repeated several times with the military officials, but nothing came of it, and no harm was

¹ Sakomizu stopped at this point and said with great feeling that he thought the Emperor was the wisest statesman in Japan today, the most perspicacious. Despite the isolation, he knows well what is going on and understands it. He recalled that one day at lunch Tojo told Sakomizu that he had tried to "educate" the Emperor to start the war and found it very hard. Sakomizu went on to state that the Imperial Rescript at the start of the war was drafted by the Cabinet, as always, but that the Emperor insisted on making one alteration before he signed it. After the sentence which states that war with the United States and Great Britain was an inevitable thing, the Emperor inserted another, as follows: "Ani chin ga Kokozashi naranya?" Translated, this means, "How can this be our own will?" Sakomizu insisted that this means something very important. The government could agree to include the sentence, since it appears merely to elaborate the preceding statement of inevitability, but it also means, when it is understood, that the Emperor rather than the government wrote it in, that the war was not the Emperor's will but was forced on him by his obligation to take the government's advice under the constitution.

The Decision for Peace

done to me. You see, the military were trying very hard to cancel the Emperor's decision to accept the Potsdam Declaration unconditionally.

The official answer of your government was received on the morning of the 13th, as you know. We had a Cabinet meeting beginning at 1 p. m. The discussion was confined entirely to the part which said that the ultimate form of the Japanese Government should be decided by the Japanese people themselves. Some said that this meant acceptance of our proposal, while others said that it was a refusal.

It is difficult to explain the second opinion, that this was a refusal of our offer. (Sakomizu paused at this point, reflecting.) I forgot to say earlier that in our cable to the United States, which I drafted myself, I had stated that the "legal position" of the Emperor should not be altered. Hiranuma, President of the Privy Council, who is a very theoretical nationalist, believed that the "prerogatives" of the Emperor are not derived from the Constitution, so that the position of the Emperor is not a legal but a natural one. He, therefore, insisted that the word "prerogatives" be substituted for "legal position." That was all we meant by the statement anyhow. But I was over-ruled.

About 13 ministers held the opinion that the American answer was acceptable, that the Japanese people could decide the ultimate form of the government. Three believed that it was unacceptable because the Emperor's position should not be dependent upon the people. Again no conclusion for the conference was reached, and we declared an intermission about 6 p. m.

I thought that another conference in the presence of the Emperor would be necessary, but I saw that was not going to be possible when the members of the military staff came to see me and said, "You used a trick the other night (to get the Imperial decision)." They thought I had arranged and staged everything. Nevertheless I asked the military and naval chiefs of staff to sign a request for a second conference in the presence of the Emperor. They refused. They did not want the Emperor's decision to be apparent.

(All this was going on while the Cabinet session was at intermission. As you can see, these intermissions are a very convenient thing.) I wondered what to do. The military had closed one path to a decision. I was very tired, and I thought it would be a good thing if we all got some sleep that night. But San Francisco was still broadcasting, and I was afraid of that atomic bomb. I suggested to Suzuki that the cabinet meeting should be postponed until

morning and that I would talk with the military people that night. I said I would talk with them, but I had no idea how I would get through them.

The two chiefs of staff had a talk with the Foreign Minister all that night. They wanted him to put the question to the American government again, to get the answer more exactly. The Foreign Minister told them that that would mean cutting the slim string of communication between the two countries, so he would not agree. They pressed him all night. I stayed with them until 2 a. m. The Foreign Minister insisted that we had been able to establish a very delicate relation with the American Government, that to ask the question again would be construed as a refusal, which would result in the destruction of communications between the two governments.

Early on the 14th the Prime Minister came to the office about 8 o'clock. I said, "Did you sleep well?" He said, "Yes, did you?" I said, "One half hour."

At 2 a. m. I had asked Domei, completely on my own responsibility, to broadcast that the Japanese Government had almost decided to accept the reply of the American Government. The military people were very angry with Domei, and they (Domei) anxiously asked me to explain that I had ordered it. But that is a minor point.

Suzuki said to me, "What shall we do now?" I suggested that he go to the Imperial Palace and ask the Emperor to call a conference of the Cabinet, the two chiefs of staff and Hiranuma in the Emperor's presence. The Emperor can do that at any time, although the government cannot request such a meeting without the signatures of the chiefs of staff on the requesting document. Mr. Suzuki went to the Palace and returned about 10 o'clock. Immediately after the return, a telephone call came from the Imperial Household Ministry summoning all these people to a conference. All were in informal clothes, but with the permission of the Imperial Household Minister, we all went as we were.

The 16 Cabinet Ministers, the 2 chiefs of staff, Baron Hiranuma, the directors of the Bureaus of Military and Naval Affairs, and I were present at the conference. Mr. Suzuki announced that the Emperor had called us to discuss the matter of the American reply in his presence, so that everyone who had an opinion should express it freely. Anami (War Minister), Gen. Umezu (Chief of Staff), and Adm. Toyoda (Navy Chief of Staff) expressed the opinion that the American answer was insufficient, so that we had better ask them again for a more concrete answer or, if that were impossible, to

continue the war. No one else took that position.

Then the Emperor spoke. He said: "It seems to me that there is no other opinion on your side (the military's). I shall explain mine. I hope all of you will agree with my opinion." This was very important. You must remember that the Emperor never used to say anything in these conferences. Now he asked that the government agree with the opinion he expressed. This is a great thing in our political history. "My opinion is the same as the one I expressed the other night. The American answer seems to me acceptable." Everything then was decided, and all the members of the conference then really recognized that Japan had been defeated for the first time in her 3,000-year history. Everyone cried like children. I had intended to write down the Imperial expressions, but I found I could not. Yet all there remember the Emperor's words to this day, just like a dream.

The Emperor gave almost the same reasons for his opinion as he had in the former meeting with the smaller group. He expressed his opinion on the reconstruction of Japan. He said that all must cooperate together. He then asked the Government to draft the Imperial Rescript to stop the war. He said that all the people who will suddenly realize what the military situation is may be surprised. So if the ministers think it would be better, he said he would speak personally to them over the radio. He said, "The military and naval forces especially will be shocked, so I will go any place the Ministers want and explain the situation to the soldiers personally." The Emperor was wearing snow-white gloves, and he himself put his hand to his eyes to brush away the tears. To see that, everyone felt that the Emperor had come back to the people from his capture by the military.

The decision was made and the conference was closed. The Cabinet members returned to their office and made the formal decision accepting the American answer. I started to draft the Imperial Rescript. Because I remembered his very words, it was not difficult. I put it in the Chinese style of writing. You should read the Rescript very carefully because it gives the Emperor's real statement, unlike the usual Rescript, which is drafted entirely by the Government.

The answer to the American Government was sent out about noon. The Rescript was issued at 11 p. m., and at 12, midnight, the Emperor's broadcast to the people was recorded for broadcast.

At 4:30 the next morning (August 15) I was awakened by the noise of machine guns outside the Cabinet offices. At first I thought it was American

planes on a raid, but I soon discovered it was an attack by 50 or 60 Japanese soldiers. I immediately left the building by an underground passage, and went to the Metropolitan Police Headquarters. The machine-gun fire lasted only 2 or 3 minutes; they entered the building and, finding no one of any importance around, tried to set fire to it. They left in about 30 minutes and went to the private residence of Mr. Suzuki, which they burned to the ground. Just 5 minutes before they arrived, I had called the Prime Minister, told him of the attack on the Cabinet offices, and suggested that he should get out at once, as it seemed likely that they would go next to his private residence.

At the Metropolitan Police Station I found that the Imperial Household Ministry had been occupied by a military force who were trying to get the record of the Emperor's broadcast and destroy it before it could be put on the air. They did not succeed in locating it. (Gen. Shizuchi) Tanaka (Commander of the Eastern District Army, Tokyo) spoke to the leaders of the group, trying to persuade them to vacate the premises, and he finally succeeded about 7 o'clock in the morning.

At noon on the 15th of August the broadcast of the Emperor's speech to the people was made.

Q. I understand that the attack on the Cabinet offices did not come completely as a surprise to you?

A. Informed people suspected that something was going on as early as the 12th or 13th. Posters were put up in the Ginza and elsewhere urging people to kill "the Badoglios of Japan, Suzuki, Sakanizu, Yonai, Okada, Togo, and Hiranuma". Hiranuma's name was left off some of the posters and leaflets. The police said they were put up by "Ronin" who were connected with the military.

Then on the 15th, all the military airplanes came out. They had not gone up to attack the B-29's for a long time, but they all came out then, hundreds of them, and spread leaflets saying, "We will continue the war" and "The Imperial Rescript is a forgery."

For one month I lived with two policemen at all times, and at the recommendation of the police I changed my sleeping place every night. It was not so bad, but the rice problem was difficult, as it is rationed, and moving all the time I could not get proper rations for me and my two bodyguards.

This was the second time I had had machine-guns turned on me, the first being in the February 1936 incident, when I was secretary to my father-in-law, Okada, the Prime Minister. Then I was not a marked man, as they were after the Prime Minister himself. This was the second time, when they were really after me. I may not be so lucky the third time.

The Axis in the Mediterranean

Second instalment of an essay by Vice-Admiral Weichold, former German commander in the Mediterranean. Slightly condensed from the original. Restricted.

About August 22, 1941, the Italian fleet met the offensive sweep of the Gibraltar squadron to the east by cruising to the east and south of Sardinia. It must be regarded as the greatest misfortune for the Italian Navy that this first large-scale operation under the new active leadership of Admiral Sansonetti should have had no success. The main responsibility for its failure to make contact and engage the enemy lay with the Italian aerial reconnaissance units. This again bore out the oft-repeated opinion of the German Admiral that the withdrawal of the German air corps would make the execution of the Mediterranean war at sea very difficult; apart from the value of the active support given by the Luftwaffe to the land warfare in North Africa during the month of August. Tobruk, the harbor installations of Alexandria, Suez and the Suez Canal itself were successfully attacked. The direction of the Mediterranean war, however, suffered as a whole from the failure of cooperation between the two forces indispensable to each other, namely the Italian fleet and the Italian air force. The air force would not regard itself as involved in the war at sea and refused to serve its interests.

Between the 25th and 29th of September another British break-through took place in the Sicilian channel. The Italian Navy met with reverses similar to those of the 22d-24th of August. The Italian fleet, including two modern capital ships, was on the afternoon of the 27th of September east of Sardinia. As the British squadron had at its disposal more than two aircraft carriers, the Italian Commander-in-Chief avoided an engagement. Again, the lack of a powerful Italian Fleet Air Arm and the withdrawal of the German Air Force from Italy had a decisive effect. The shadow of the tragic battle of Matapan, during which the Italian naval forces had felt the same deficiency, was ever before the eyes of the Italian leaders. Only an operational and tactical collabora-

tion with the German air corps could have altered the situation. All proposals then made by the German Admiral for the use of the German air forces in the Mediterranean sea warfare were turned down by the Luftwaffe.

Axis Shipping Losses

In 1941, the first real effects of the increased shipping losses were noticeable in the shipping space available. It was no longer possible for all convoys to include ships loaded with heavy material. This caused a remarkable decline in the facilities for the transport of heavy vehicles. The German admiral had on the 18th of August already pointed to this shortage of shipping space and asked for help.

"... Apart from the possible mounting of an offensive in this theater, which owing to the geographical situation would necessarily increase the demand on transport, the mere maintenance of the military forces overseas requires more tonnage than will be available in the future if the present rate of losses continues. An appreciable decrease in losses is in no way to be reckoned with. Thus, from a military point of view, it is of the utmost necessity that the question of building new ships to replace the losses should be investigated, especially in the case of Italy. Moreover, the speediest methods of production should be sought so that there shall be no vacuum endangering the present theaters of war or becoming a serious hindrance to future operations. This problem is a joint German-Italian concern of a military nature and of the utmost urgency."

As with all German-Italian problems, this one was neither solved nor dealt with effectively.

In October another hindrance to the Italian direction of the war at sea became apparent in the increasing shortage of fuel oil stocks. Since February 9, 1941, the German admiral had often

UNITED STATES STRATEGIC BOMBING SURVEY

JAPAN'S STRUGGLE TO END THE WAR

CHAIRMAN'S OFFICE

1 JULY 1946

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U.S. STRATEGIC BOMBING SURVEY

JAPAN'S STRUGGLE TO END THE WAR

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as of 1-10 June, 1945

F O R E W O R D

The United States Strategic Bombing Survey was established by the Secretary of War on 3 November, 1944, pursuant to a directive from the late President Roosevelt. Its mission was to conduct an impartial and expert study of the effects of our aerial attack on Germany, to be used in connection with air attacks on Japan and to establish a basis for evaluating the importance and potentialities of air power as an instrument of military strategy, for planning the future development of the United States armed forces, and for determining future economic policies with respect to the national defense. A summary report and some 200 supporting reports containing the findings of the Survey in Germany have been published.

On 15 August 1945, President Truman requested that the Survey conduct a similar study of the effects of all types of air attack in the war against Japan. The officers of the Survey in Japan, who are all civilians were:

Franklin D'Olier, Chairman.

Paul H. Nitze,
Henry C. Alexander, Vice-Chairman.

Harry L. Bowman,

J. K. Galbraith,

Rensis Likert,

Frank A. McNamee,

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Fred Searls, Jr.

Monroe E. Spaght,

Dr. Louis R. Thompson,

Theodore P. Wright, Directors.

Walter Wilds, Secretary.

The Survey's complement provided for 300 civilians, 350 officers, and 500 enlisted men. The military segment of the organization was drawn from the Army to the extent of 60 per cent, and from the Navy to the extent of 40 per cent. Both the Army and the Navy gave the Survey all possible assistance in furnishing men, supplies, transport and information. The Survey operated from headquarters established in Tokyo early in September, 1945, with sub-headquarters in Nagoya, Osaka, Hiroshima and Nagasaki, and with mobile teams operating in other parts of Japan, the islands of the Pacific, and the Asiatic mainland.

It was possible to reconstruct much of wartime Japanese military planning and execution engagement by engagement and campaign by campaign, and to secure reasonably accurate statistics on Japan's economy and war-production plant by plant, and industry by industry. In addition, studies were conducted on Japan's overall strategic plans and the background of her entry into the war, the internal discussions and negotiations leading to her acceptance of unconditional

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surrender, the course of health and morale among the civilian population, the effectiveness of the Japanese civilian defense organization, and the effects of the atomic bombs. Separate reports will be issued covering each phase of the study.

The Survey interrogated more than 700 Japanese military, government and industrial officials. It also recovered and translated many documents which have not only been useful to the Survey, but will also furnish data valuable for other studies. Arrangements have been made to turn over the Survey's files to a permanent government agency where they will be available for further examination and distribution.

The present report was prepared by the Chairman's Office under the editorship of Commander Walter Wilds, USNRC.

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U.S. STRATEGIC BOMBING SURVEY

JAPAN'S STRUGGLE TO END THE WAR

PREFACE

While the impact of Allied air operations in the entire Pacific war bore directly upon the enemy's military and economic capabilities for resisting, only by translating these military and economic effects into political events could our announced war aim of unconditional surrender be realized. Japan's acceptance of defeat without invasion while still possessed of two and a half million combat-equipped troops and nine thousand Kamikaze airplanes in the home islands, reveal how persuasively the consequences of our operations were translated into political results. The nature of Japanese politics and its vulnerability and responses to air assault constituted therefore a major and significant line of inquiry for the Survey.

The "political target" comprised a ganglion of Army, Navy, government and Imperial household factions which together decided major questions of national policy. Fortunately, most of the pertinent questions relating to how Japan was brought to acceptance of the Potsdam Declaration find their answers in the simple chronology of events which can now be narrated in some

detail for the period from the collapse of TOJO in July 1944, to the Imperial rescript of 15 August 1945. The evidence is chiefly in the testimony obtained by Survey interrogation of the Army, Navy, government and Imperial household leaders who participated or were influential in the struggle within Japan over whether to continue the war or to accept surrender. The inquiry might have benefited from testimony of certain key figures who were not available to the Survey. TOJO, KOISO, TOGO, and a few others impounded for trial as war criminals could not be interrogated. A few, notably General ASAMI, the war minister in the SUZUKI cabinet, had committed suicide. Since the Emperor's participation in the crucial events of the period preceding surrender had been revealed and corroborated by other participants, an interview with Hirohito would not have been productive. It is felt that the general picture of the course of events would not have been changed materially had these persons been available for interrogation.

I. Some Properties of the Political Target

To assess the events of surrender requires a capsule reminder of the interrelated pressures, the interlocking mechanism of Japanese politics. The starting point is that Japan was governed largely by a consensus among the oligarchy of ruling factions at the top. No major decisions of national policy could

be reached until such a consensus had been obtained. This process inevitably took time and involved complicated pressures and struggles of will among those of differing opinions.

A flow-chart of the chief pressures would show the Lord Privy Seal (Marquis Koichi KIDO throughout the war period) as the Emperor's political agent, an observer and estimator of the current government's problems and its capabilities for coping with them. To one side, clear of responsibility or authority, but in this instance with pipelines into the government which informed them of the true state of affairs, were the Senior Statesmen or Jushin. These ex-premiers could not enforce their views, but did apply persuasive and informed pressure on the Privy Seal and other government leaders. The Jushin also had interlocking membership with the Privy Council which approved important decisions in foreign policy, and individual Jushin were frequently close to the Emperor. Then there was the cabinet, which once formed could perpetuate itself so long as it was strong and successful. An important test of its strength and success was its ability to absorb or modify the views and policies of the Army and Navy, who named their own cabinet ministers, whose ministers and chiefs of staff had direct access to the Emperor, and who were influenced until the end by the fanaticism of the majority of Army officers and younger Navy officers. One important wartime innovation to this flow-chart,

the Supreme War Direction Council or Inner Cabinet, will be explained in a later section dealing with KOISO's time.

This political mechanism had several special characteristics which were peculiar to our eyes and important to these events - (1) the Lord Privy Seal was the custodian of the Emperor's political powers and chief protector of the "national polity" or Tenno system; (2). the Japanese had a fine penchant for diffusing political responsibility; (3) politicians and ardent militarists, as did the Japanese people themselves, viewed the Emperor and sacred homeland through an emotional and reverent haze; (4) the system of government afforded enormous areas wherein personal judgments and estimates of a small group determined ultimate policy; (5) opinions and attitudes of the general public had significance only as a single and subsidiary factor in the considerations of the leaders.

II.

Behind the Collapse of TOJO

In the period between the Pearl Harbor attack and June, 1944, Japan's defeats at Midway, in the Solomons, New Guinea and the Marshalls, coupled with the crippling effects of her shipping losses, produced political consequences which were apparent in frequent cabinet shuffles, TOJO's increase of personal authority through the multiple cabinet jobs he assumed, and tightened controls intensifying the government's efforts to program military output for a protracted war. The

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first definitive break in the political coalition which began the war occurred following our success at Saipan. Ten days thereafter, on 18 July, 1944, the cabinet headed by General Hideki TOJO fell, after being continuously in office since 20 October, 1941.

This marked a significant turn in the course of Japan's wartime politics, the importance of which in retrospect is difficult to overstress. It was not merely the result of an immediate crisis. Even at that early date, there were symptoms that opposing elements had finally found means of applying pressure against the fanatic exponents in Japan's militarist clique. It revealed in clear trace the effective, though still undercover, intervention of factions which had either opposed war before Pearl Harbor, or gone along, or "retired" in the first phases of the conflict.

To explain the dilemmas and activities of those leaders who felt in the Spring of 1944 that Japan was facing certain defeat or at least that the time had come for positive steps to end the war, it is useful to restate briefly the basis on which Japan began the war in December, 1941. Japan entered the war securely in the hands of the radical military clique that rose to power in Manchuria and was led and symbolized by TOJO. This group had already achieved a police state and the controlling position in

Japanese policy during its uneasy coalition with the conservatives in the two preceding KONOYE governments. It is noteworthy that the clique took Japan to war without concrete minimum or maximum objectives nor any clear conception as to how the war could be brought to a close. The decision to attack was roughly calculated as a two-way gamble. If the European Axis defeated Soviet Russia, Japan would require chips to play on the winning side at the peace settlement with the United States and Britain that might well follow. On the other side, and independent of European events, a quick drive to the Southern Resources Area accompanied by a series of stunning and crippling defeats of the United States forces would redress Japan's relative strength and create a situation in which the United States might be willing to negotiate a peace by trading out the issues on terms favorable to Japan. Great confidence was put in the eventual superiority of Japan's fighting spirit over the potential material superiority of the United States. This calculation, whatever its other shortcomings, obviously contained at least two serious mis-readings regarding the United States, first, in failing to appreciate the tenacious and passionate finality with which America would prosecute the war, and second, in underestimating the military importance of the enormously greater economic potential with which the United States would create and bring

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to bear a technically superior force.

The risks involved were understood and asserted by some leaders in the debates which preceded Pearl Harbor. Their original concern gave them a basis for recognizing as early as Spring, 1944 that Japan was facing ultimate defeat. By that time United States determination to fight and her ability to mount successful thrusts in the Pacific even before opening the Second European Front, had already been demonstrated for all who knew the true situation to see. The political problem of those who saw the situation was to discover and circulate among other leaders in retirement or outside the government a true picture of the war, and then to unseat the TOJO government in favor of one which would bring the war to an end. Prime illustrations of such moves at this time were the operations of TAKAGI and SAKOMIZU.

Rear Admiral Soichi TAKAGI, who was attached to the ministerial Secretariat of the Naval General Staff, made a study between 20 September, 1943 and February, 1944, of the war's battle lessons up to that time. He concluded that Japan could not win and verbally presented his findings in March, 1944 to Admiral Mitsunasa YONAI and Vice-Admiral Seibi INOUE. TAKAGI's study, interestingly enough, was undertaken at the end of the second year of the war - the time beyond which, the Japanese Navy's top command had

estimated before hostilities, Japan could not fight a successful war. TAKAGI's estimate was based on an analysis of fleet, air and merchant ship losses suffered to date, the serious difficulties in acquiring essential imported materials, the internal confusion in Japan, and a growing feeling among the "intelligensia" that TOJO should be let out. It seemed clear to TAKAGI that potential long-range air attacks on the home islands and Japan's inability to import essential materials for production had created a situation which dictated that Japan should seek a compromise peace. In TAKAGI's view Japan at this time should have envisaged withdrawing from China and giving up both Korea and Formosa as part of the peace terms. His study in any case documented the fears IONAI and others held before the war and lent support to the increasing but still carefully guarded concern of their fellow Jushin that all was not well with TOJO's prosecution of the war.

Hisatsune SAKOMIZU is another early example of a connecting link between the unpleasant facts of the war and the senior statesmen outside the government. As a member of the Cabinet Planning Board in 1943-1944, he had given information as to the unfavorable war situation to his father-in-law, Admiral Keisuke OKADA, who retailed it to KIDO among others.

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OKADA also had word sent to TOJO that it would be best for him to resign.

All this was not only educational as to Japan's true condition, but indirectly helped to build up political pressure for the fall of TOJO. Among important examples of the way this pressure worked were: (1) TOJO had to reconstruct his cabinet just before the Marianas campaign (Saipan was invaded on 15 June 1944), when Shinsuka KISHI, the Commerce and Agriculture Minister, and Mamoru SHIGEMITSU, the Foreign Minister, threatened to withdraw; (2) YONAI, supported by the Jushin, refused TOJO's request that he join the cabinet as minister-without portfolio; and (3) the resignation of Shigetaro SHIMADA, the Navy Minister, which helped to force out TOJO three days afterward, had been actively assisted by the senior statesmen.

These steps give the pattern of the behind-scenes talks and illustrate the combined efforts of (1) those who already knew that Japan, facing defeat, should save itself by accepting Allied terms, (2) those who believed Japan should take active steps to end the war, hoping to achieve terms better than unconditional surrender, and (3) those who realized Japan's situation was desperate, but thought improved resistance could be achieved only by dropping TOJO.

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The loss of Saipan, followed by TOJO's collapse, marked a major turning point of the war and brought forth the cabinet of Kuniaki KOISO, a retired Army general who was known as a TOJO critic. This government was a disappointment to the more zealous peacemakers and conceivably an inept choice of that ever-cautious political litmus paper, Marquis KIDO. Nevertheless, KOISO's government broke the grip of the TOJO clique as the ruling faction, took important and necessary steps toward peace, and may even have been an unavoidable step in the transition from TOJO to the surrender cabinet of Admiral SUZUKI.

When designated to succeed TOJO, KOISO received an Imperial admonition to give Japan's situation a "fundamental reconsideration" looking to the termination of the war. If this murky injunction was intended to seek peace, it early became clear that the new government as a whole by no means understood its mission since the "reconsideration" resulted in a decision to continue the war with renewed vigor and further sacrifice.

At this time, in the late summer of 1944, intensive air assault on the home islands had not yet begun. But output of a number of essential items had already passed the peak, shipping losses had reduced imports of essential materials

below the needs of the existing industrial plant capacity. Japan faced a declining output of such war necessities as aircraft, oil, transport, steel and coal. Although public confidence in the war remained high, morale of the leaders and "intelligensia" was falling, principally as knowledge of previous defeats and difficulties became more generally known to the further discredit of the military factions.

Among the first moves of the new KOISO government was the creation of the Supreme War Direction Council. On 5 August 1944, three weeks after the fall of TOJO, this new Inner Cabinet was formed. Announced purpose of the Council was "to formulate a fundamental policy for directing the war and to adjust the harmonization of the combined strategy for politics and war". It comprised six regular members--the premier, foreign minister, army minister, navy minister; army chief of staff and navy chief of staff--who could, however, bring in any other cabinet minister as a regular member when necessary. In addition, the two deputy chiefs of staff attended meetings but did not vote, and the Council had a secretariat. The group was formed originally as a liaison between the military and the cabinet, but its composition and dominant role made it in practice an inner war cabinet concerned with the highest policies and plans such as measures to maintain fighting strength, central economic decisions,

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whether to continue the war, etc. The agenda originated within the Council itself. Its decisions had to be ratified by the full cabinet before becoming final. It also had direct access to the Emperor and the Emperor could himself initiate meetings with the Council. The Council, like the cabinet, did not work on majority votes, but on general agreement or "unity".

Important issues on which unity was lacking were presented to the Emperor usually in the form of alternatives for his choice. To one acquainted with the Japanese talent for divided authority and controls, piecemeal responsibility and decisions, and considering the past failures to cope administratively with the necessities of total war, the Council may be taken as an outstanding accomplishment.

Nor is it possible to exaggerate the central importance of this committee, for certainly from early May of 1945 until the August surrender the enemy's principal problem was to give expression to its political decision to end the war. During that period the military and economic and morale effects of our operations were significant chiefly as they bore directly upon the top political decision already made and the struggle between those political leaders who had already determined to find a way out of the war and the militarists who were determined to continue it. Cumulative difficulties and defeats bred further determination among the peace seekers who increasingly opposed the

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intransigency of the militarists.

The Council accordingly was on one hand a symbol and test of how far Japan's original warmaking coalition had been discredited and liquidated, and on the other hand a successful reintegration of the ruling factions which could act with authority and purpose in solving their dilemma. The magnitude of this last point can be shown by citing the following considerations. First, the two chiefs of staff (and their deputies) who formerly had been not merely responsible for executing operational plans but also almost autocratically capable of formulating them, were now drawn into discussions of overall national policy, matters of economic capability, the political realities, etc.; the military were finally harnessed and joined to political, economic and civilian requirements. Second, the Council afforded a few key ministers who were determined on peace a more effective and enhanced basis for achieving it through domination of a small group, working in the greatest secrecy, with direct and official access to the Emperor.

Early in September, 1944 YONAI, who had become Vice-Premier and Navy Minister under KOISO, directed TAKAGI to resume his secret studies of steps to get out of the war. Working with YONAI and the Navy vice-minister, Vice Admiral Seibi INOUYE, TAKAGI considered such questions as (1) how to

get Army agreement to end the war; (2) issues involved in possible Allied terms such as demands on Japan after the war, reparations, protection of the "national polity"; (3) the problem of public opinion and morale in the event of peace; (4) how to reach the Emperor and work through him to accomplish their purpose. As these studies progressed, private briefing sessions were held with Prince Fumimaro KONOYE, KIDO, Marquis Tsuneo MATSUDAIRA, the Imperial Household Minister, OKADA, and a number of others. Sometime later Admiral Koshiro OIKAWA, the chief of naval staff, and Admiral Jisaburo OZAWA, the deputy chief of naval staff, were informed of these maneuvers. Contacts were also established with Army people. TAKAGI testified that quite a number of them were convinced and some, in fact, brought pressure upon the Army minister. This served, however, only to stiffen the Army's attitude against all peace moves and many on the Army side recanted for reasons of discipline and personal safety.

In these conversations some differences of opinion emerged as to peace terms--some favored giving up all occupied territories, whereas others thought Formosa and Korea were required for food. It was generally agreed that the only way to reach the public was through the Emperor, if conformity to a peace decision were to be secured and a possible military coup avoided. OKADA approached KIDO frequently on this

subject. TAKAGI reported that KONOYE had already made up his mind along similar lines before these talks began. TAKAGI further stated that as a result of these activities they were prepared to carry through toward peace in the face of Army opposition, if need be even to the point of withstanding revolution.

Although the peacemakers were well represented in the KOISO government, the cabinet's decision was taken to continue and renew the war effort hoping for an improved position from which to seek a compromise peace. The validity of the peacemakers' estimates was demonstrated by further attrition of air forces and shipping, a declining basic industrial production and a seriously lowered civilian livelihood. In the meantime, the initial air raids on the Empire coupled with loss of the Philippines had a deepening effect upon these attitudes. The leaders especially feared the threat to production, the decline in public morale, and a break-up of Japan as Germany even then was breaking up.

By December 1944 private conversations among the top ruling factions, including KIDO, KONOYE, YONAI, OKAWA, Baron Kiichiro HIRANUMA, etc. were addressed to problems created by urgent need for peace. The Emperor on his own initiative in February 1945 had a series of interviews with

the senior statesmen whose consensus was that Japan faced certain defeat and should seek peace at once.

Discussed at least, during March 1945, was the plan to initiate peace steps through the mediation of China. Prince Naruhiko HIGASHI-MUNI was the chief advocate of this scheme, and it received some consideration and support among the Jushin and at the foreign office. Choice of China as Allied negotiator was based in part on the ingenuous notion that since "she was a neighbor and fellow member of the co-prosperity sphere", her mediation would be more suitable than direct approaches to the U.S. Terms were to be based on Japan returning to her pre-1931 boundaries. There is no clear evidence available to the Survey as to how far the plan was carried, but what is significant here is that at least by March 1945, a specific peace overture was under cabinet discussion.

In this desperate situation, and since important elements both within the government and among the leaders outside were favoring and initiating peace moves, it is legitimate to ask why the KOISO Cabinet did not end the war in the Fall of 1944. Members of Japan's original war-making coalition though no longer in full control still had great strength within the top Army command, the middle ranks of both

services and the bureaucracy of the government. They constituted a distinct threat of revolt or a coup in the estimate of the civilian and Imperial household leaders. Certain general and psychological factors also determined the further conduct of the war and the central decision by the KOISO regime: (1) it is clear that the Japanese leaders entered the war deeply convinced that they were fighting for their very national existence and life, whereas the United States they believed was merely pressing for economic advantages and a set of principles, but not for vital security. (2) Japan had no specific plan other than negotiation for ending the war she began. A predilection for negotiation--demonstrated in terminating the Russo-Japanese war, efforts to enlist the U.S. in bringing the China Incident to a close, etc.--maintained a hope that Japan could trade it out with the Allies. (3) The Casablanca statement and the Cairo declaration setting forth Allied terms for unconditional surrender were still considered by Japan's leaders to be just declarations, not actual final terms to be imposed. (4) The desire to save face, to preserve the Tenno system, and fear of the military and the police at this period helped the factions favoring continued resistance. (5) The information policy of minimizing U.S. successes and capabilities, while distorting their own losses and exaggerating their ability to conduct effective operations, had left the people ignorant of the fact of Japan's actual military situation at this time. Some government factions feared internal

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chaos, "communistic revolts and disorganization" if the true situation became known.

Thus so nicely balanced were the ruling factions and cliques that their interrelation conditioned the expression of policy as well as its formation, and accounts in part at least for the unusual time-lapse between the top civilian political decision to accept defeat and the final capitulation. The result in the KOISO Cabinet at least was a temporary stalemate.

The Okinawa landings on 1 April were quickly followed by KOISO's fall on 8 April and the designation of Admiral Baron Kantaro SUZUKI as Premier.

IV.

The SUZUKI Cabinet

KIDO's estimate affords the best guide to the political situation which produced the SUZUKI government. The Lord Privy Seal stated to the Survey that Japan's situation called for a man who could think fundamentally, had deep convictions and great personal courage. Although many among the peacemakers had long favored a stronger man than KOISO, KIDO at least was convinced that so long as Germany remained in the war Japan would be in danger of a military coup in the event firm and positive steps were taken immediately to end the war. In any case the hopes for positive steps under KOISO's aegis were not fulfilled, primarily because he was not strong enough to stand up to the military. When SUZUKI was named Premier, KIDO

stated the question was not whether to end the war, but by what means and how quickly.

SUZUKI informed the Survey that when he assumed office "it was the Emperor's desire to make every effort to bring the war to a conclusion as quickly as possible; and that was my purpose". This created a position SUZUKI described as difficult. On the one hand he had instructions from the Emperor to arrange an end to the war; on the other hand any of those opposing this policy who learned of such peace moves would be apt to attack or even assassinate him. Thus with the general staffs, government in general and the people, he advocated increased war effort and determination to fight, whereas "through diplomacy and any other means available" he had to negotiate with other countries to stop the war.

Almost immediately, SUZUKI ordered his chief cabinet secretary, SAKOMIZU, to make a study of Japan's fighting capabilities and whether they were sufficient to continue the war. SAKOMIZU concluded in May that Japan could not continue the war, basing his estimate on Japanese studies as to the inability to produce aircraft, losses and damage to shipping, the precarious food situation and the anti-war sentiments of the people. (A copy of this estimate came into Survey hands from YONAI in November 1945, and is appended in translation as "Survey of National Resources as of 1-10 June 1945"). SUZUKI, who agreed with the estimate, presented it to the Emperor. Concurrently he asked ex-premier

Koki HIROTA to sound out the Russian ambassador to Tokyo, MALIK, privately as to the Russian attitude toward interceding with America.

Early in May (prior to the 18th according to a statement of Navy Chief of Staff, Admiral Soemu TOYODA) the Supreme War Direction Council began to discuss ways and means of ending the war. Concurrently other meetings of the Council were going on with the view of obtaining Russia's services at an opportune time. Foreign Minister TOGO was leader of this. While HIROTA was talking with MALIK, Ambassador SATO had been instructed in Moscow to prepare the way for a Japanese emissary to discuss improvement of Soviet-Japanese relations and Russia's intercession to end the war. Specific terms for ending the war apparently did not come up at this time, but the Council was prepared that whatever the result they "would be worse than pre-war conditions". The Potsdam declaration had not been issued, but it was felt that the Cairo declaration terms would not actually be applied; it was looked upon as a declaration only, whose terms could be reduced by negotiating and by being in a position to exact "heavy sacrifices" if the war continued.

Thus during the forepart of May two separate but interrelated topics were before the Inner Cabinet, one dealing with Japan's inability to continue the war, the other initiating talks with Russia for intercession. Shortly after

the end of the European war, 8 May, the war minister, General Korechika ANAMI, asked the cabinet for an Imperial conference to decide the "fundamental principle of the war", that is whether to continue it. This action, while not indicating that the army was ready to quit (on the contrary the war minister and army chief of staff urged continuance of hostilities), did confirm KIDO's belief that the Army would permit open consideration of the question within the cabinet only after Germany's collapse. Perhaps even more important it was an affirmative test of the wisdom in selecting ANAMI as war minister. For even though he held out to the last against unconditional surrender (ANAMI committed suicide on 15 August), at no time did he obstruct the positive peace steps which were being taken by SUZUKI and the others, although by resigning he might have forced the SUZUKI government out of office. This negative support of the peace moves by certain Army leaders would have afforded an interesting line of inquiry had ANAMI et al been available to the Survey for questioning. The Navy of course was divided, with YONAI among the foremost advocates of peace and Admiral Soemu TOYODA, the navy chief of staff, siding with the Army. But TOYODA also was restrained in his opposition to cabinet peace councils; he testified that "only two persons in all of the Navy had any knowledge of

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the discussions relating to intervention of Russia, the navy minister and the chief of the navy general staff. It may be (TOYODA continued) that since frequent conferences were being held some of the others high up in the Navy Ministry might have had some suspicions, and because I felt that such might be the case I stated to my deputy chief of staff that although conversations were being carried out relative to the conclusion of the war, that was not an affair with which officers should be concerned...I believe that a similar situation prevailed in the Army, that only two officials had definite knowledge of these discussions."

From June until the close of the war, the narrative of political events in Japan is clear and rather detailed from the testimony of YONAI, TOYODA, SUZUKI, UMEZU and SAKOMIZU, corroborated by KIDO, KONOYE, HIRANUMA and others. After ANAMI's request for an Imperial conference SAKOMIZU prepared a statement for that occasion which opened by saying that the war should be "accomplished", and the Emperor's reign and the homeland kept intact. This was followed by the details of SAKOMIZU's estimate prepared shortly after SUZUKI assumed office. On 6 June the six regular members of the Council discussed what steps should be taken to prosecute the war. Also at the meeting were the chief cabinet secretary, the chief of the Navy's military affairs bureau, the chief of the

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Army bureau of military affairs, the head of the cabinet research bureau and the minister of agriculture and commerce. The conclusion was that unless some radical measure could be adopted to arouse the people, the nation's war power was bound to decline very rapidly. At this session, as TOYODA explained, "no one expressed the view that we should ask for peace--when a large number of people are present it is difficult for any one member to say that we should so entreat".

On 8 June the six regular members of the Council conferred with the Emperor. The statement was read by the Emperor who made no comment at this meeting. Each of the others expressed his own official opinion, but none as yet expressed his real feelings. On 20 June the Emperor on his own initiative called the six council members to a conference and stated that it was necessary to have a plan to close the war at once, as well as a plan to defend the home islands. He asked what the council thought of that idea. The prime minister, the foreign minister and the Navy minister stated that they fully concurred with the Imperial view and that such steps were then being taken to that end. Then the Emperor in turn asked when the ministers expected they would be able to send a special ambassador to Moscow. The reply was that it was uncertain but they hoped he could be sent before the Potsdam conference.

SAKOMIZU testified that after this expression from the Emperor,

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SUZUKI decided he could stop the war; when he returned from the conference he told SAKOMIZU "Today the Emperor said what everyone has wanted to say but yet was afraid to say".

After that the government redoubled its talks with Russia and decided to send Prince KONOYE to Moscow if he were persona grata. On 10 July the Emperor called foreign minister Shigenori TOGO and said, "As it is now early July should not our special ambassador be dispatched to Moscow without delay?" Since Soviet Ambassador Malik was ill in Tokyo and the conversations there were not progressing, SATO was again instructed to put the matter directly to the vice-commissar for foreign affairs in Moscow. Russia asked for more details concerning the mission and SATO was directed to explain the mission as follows: (1) to make an improvement in relations between Russia and Japan (in view of Russia's denunciation of the neutrality pact), and (2) to ask Russia to intercede with the United States in order to stop the war. The Soviets replied on 13 July that since Stalin and Molotov were just leaving for Potsdam no answer could be given until their return to Moscow. On 12 July meanwhile the Emperor had called in KONOYE and secretly instructed him to accept any terms he could get and to wire these terms direct to the Emperor. KONOYE also testified that when SATO was sounding out the Russians he reported the Russians would not consider a peace role unless the terms were unconditional surrender,

and that this reply had a great influence on the Emperor.

In the days before the Potsdam Declaration, SUZUKI, TOGO and YONAI became pessimistic about the Russian negotiations. They expected eventually that they would have some answer; but if it were unfavorable they concluded that their only recourse would be to broadcast directly to the United States.

On 26 July the Potsdam declaration was issued. In their deliberations on that statement, which began immediately, no member of the Inner Cabinet had any objections to ending the war. SUZUKI, TOGO and YONAI felt that the declaration must be accepted as the final terms of peace at once, whether they liked it or not. The War Minister and the two chiefs of staff on the other hand felt that the terms were "too dishonorable". Discussion centered around first the future position of the Emperor, second the disposition of war criminals, and third the future form of Japan's "national polity".

On 6 August in the midst of these discussions an atomic bomb was dropped on Hiroshima. Early reports to Tokyo described very great damage, but the military did not think it was an atomic bomb until President Truman's announcement and a mission of Japanese scientists sent to Hiroshima confirmed it. On the morning of 7 August SUZUKI and TOGO conferred and then reported the news to the Emperor, stating that this was the time to accept the Potsdam

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declaration. The military side still however could not make up their minds to accept it.

These differences continued to be examined and hope of favorable word from Russia had been all but abandoned when very early in the morning of 9 August the news arrived that Russia had declared war. Although considerable pessimism had prevailed regarding the outcome of the negotiations, the government was not prepared for war with the Soviets, nor the military capable of any effective counter-plan. SUZUKI calculated that he had a choice of resigning, or taking immediate positive action which could be either declaring war on Russia and continuing until the whole nation was destroyed or accepting the Potsdam declaration. He conferred with the Emperor around 0700 and after a couple of hours decided to accept the Potsdam terms, with which decision the Emperor agreed. A meeting of the six regular members of the Supreme War Direction Council was called for 1000. After two gloomy hours it remained deadlocked as before on the two opposing opinions: (1) To accept the Potsdam declaration outright, with the understanding that it did not alter the Emperor's legal position; (2) To accept the declaration with the following conditions: (a) that the Allied forces would not occupy the homeland; (b) that the Japanese military and naval forces abroad would be withdrawn, disarmed and demobilized by Japan itself; (c) that all war crimes should be prosecuted by the Japanese government..

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SUZUKI, YONAI, and TOGO favored the first opinion, whereas ANAMI, UMEZU and TOYODA supported the second. When this three-to-three split could not be resolved, the full cabinet was called in, and after an explanation by TOGO, nine voted for unconditional acceptance, three voted for the conditional acceptance and three others favored intermediate positions. After a session lasting until 2000 without achieving unity, the cabinet declared an intermission. In this impasse SUZUKI decided to request an Imperial conference for the Inner Cabinet at which the conflicting views could be presented and the Emperor's own decision sought. At 2330 on the 9th the conference was held, with chief cabinet secretary SAKOMIZU and HIRANUMA, the privy council president, also attending. The Potsdam declaration was first read to the Emperor, then TOGO expressed his opinion, followed by all of the others who stated their views. Around 0300 on the 10th SUZUKI announced (as paraphrased by SAKOMIZU's testimony), "We have discussed this question for a long time and everyone has expressed his own opinion sincerely without any conclusion being reached. The situation is urgent, so any delay in coming to a decision should not be tolerated. I am therefore proposing to ask the Emperor his own wish and to decide the conference's conclusion on that basis. His wish should settle the issue, and the government should follow it".

The emperor then stated his own view (again paraphrased by SAKOMIJIU), "I agree with the first opinion as expressed by the foreign minister. I think I should tell the reasons why I have decided so. Thinking about the world situation and the internal Japanese situation, to continue the war means nothing but the destruction of the whole nation. My ancestors and I have always wished to put forward the nation's welfare and international world peace as our prime concern. To continue the war now means that cruelty and bloodshed will still continue in the world and that the Japanese nation will suffer severe damage. So, to stop the war on this occasion is the only way to save the nation from destruction and to restore peace in the world. Looking back at what our military headquarters have done, it is apparent that their performance has fallen far short of the plans expressed. I don't think this discrepancy can be corrected in the future. But when I think about my obedient soldiers abroad and of those who died or were wounded in battle, about those who have lost their property or lives by bombing in the homeland, when I think of all those sacrifices, I cannot help but feel sad. I decided that this war should be stopped, however, in spite of this sentiment and for more important considerations".

SUZUKI then said, "The Imperial decision has been expressed. This should be the conclusion of the conference."

Immediately thereafter the full cabinet resumed its meeting and ratified unanimously a decision to accept the Potsdam terms provided they did not alter the Emperor's prerogatives. This was cabled to the United States through the Swiss around 0700 the 10th. The U.S. reply was received from the San Francisco broadcast about 0400 on the 12th and officially about 0700 the 13th. The broadcast reply was immediately studied by the Inner Cabinet and the official documents put before the full cabinet meeting around 1300 on the 13th. Acceptance was favored by 13 ministers, but three were opposed. Early in the evening the cabinet recessed. TOYODA, the Navy chief of staff, stated the objections as follows: "On the question of the Emperor's position, the American reply made no direct statement but did state that the powers of the Emperor and the Japanese government would be subject to the authority of the Supreme Commander for the Allied Powers. The main point...had to do with the Emperor's position since it was the conviction of the Japanese people that the Emperor was a living god above whom there could be no earthly being. It was feared that the Japanese people would not readily accept the wording of the reply which placed the Emperor in a subordinate position... So the suggestion was made to query the Allied governments as to whether it would not be possible to have the orders and instruction of the Supreme Commander go directly to the Japanese government and those orders passed on by the cabinet to the Emperor who... would carry out the work connected with the termination of the war."

It is not clear whether this objection arose from a sincere endeavor to preserve the Tenno system through a typically Japanese concern with semantics, or a last-ditch effort to void the decision for peace, or fear of a military coup if the Emperor's position were not meticulously preserved. In any case, it is significant that the two chiefs of staff refused that evening to sign the document, with the premier, which was required for the government to request a conference with the Emperor. The two chiefs of staff stayed up all night with the foreign minister, pressing him to ask the American government for a more "exact" answer. The foreign minister refused, insisting that it would be construed as a refusal of the terms offered and thus disrupt the slim string of communications between the two countries. The next morning, about 0800 the 14th, SUZUKI decided to go to the Emperor privately and ask him to call an Imperial conference, which the Emperor could do at any time, but the government could not without the consent of the two chiefs of staff.

The terminal conference was held before the Emperor at 1000. Present were the 16 cabinet ministers, the two chiefs of staff, HIRANUMA representing the privy council, the chiefs of the bureaus of military and naval affairs, and the chief cabinet secretary, SAKOMIZU. SUZUKI announced that the Emperor had called the meeting to consider the American reply in his presence,

so that everyone who had an opinion should express it freely. ANAMI, UMEZU and TOYODA stated that the American reply was insufficient, that they favored asking again for a more concrete answer, or if that were impossible the war should be continued. All the others favored acceptance. Then the Emperor, as quoted by SAKOMIZU, said, "It seems to me that there is no other opinion to support your side (the military's). I shall explain mine. I hope all of you will agree with my opinion. My opinion is the same as the one I expressed the other night. The American answer seems to me acceptable." He then asked the government to draft an Imperial Rescript to stop the war, and offered to broadcast the decision to the people. The cabinet returned to their office and formally accepted unconditional surrender.

V.

The Political Target under Assault

From the foregoing calendar it remains first to outline the nature of the political target presented by Japan and second to assess various factors which contributed to the success of the assault on the enemy's will to resist.

A. To those who thought of Japanese resistance as typified by a fanatical Japanese soldier who fought until rooted out of his last-ditch foxhole, the possibility of forcing a surrender appeared to be remote. Our aim in the Pacific war was, nevertheless, to induce responsible Japanese leaders to

admit defeat. Compelling such an admission at the earliest moment constituted the objective of our attack.

In total war the nature of the political target is linked to the political structure and the spirit of the enemy. In the case of Japan that spirit differed as between the general populace and the top ruling elements. This separation of public from leaders was an important consideration. Japan had long been conditioned to oligarchic rule. Rigid police controls allowed the ideas and spirit of the leaders to form separately from those of the people. Popular morale therefore became just another factor in the reckonings of the ruling group. At the war's opening and throughout its early stages, the spirit of both leaders and people was chauvinistic, aggressive, expansionist. After the defeats at Midway, Port Moresby and Guadalcanal, Japan went on the strategic defensive. Though her advance had been stemmed, she had won an empire and needed only to consolidate her conquest. Thereafter, under the pressure of our counter-offensive which eventually exposed her home islands to direct attack, seriously reduced her fleet and air forces, and blockaded her already inadequate economy, the early hope of victory was replaced by fear of defeat. Finally, a desperate determination to resist remained.

Japan's will to resist, the prime objective of our assault, was supported mainly by military potential, production

potential, morale of the people, and such political considerations of the leadership as the preservation of the Tenno system, etc. So long as these factors supported resistance they operated, of course, as impediments to surrender. Thus affecting the determination of Japan's leaders to continue the war was not alone the actual loss of an air force capable of defending the home islands, but the loss of hope that this air force could be replaced, let alone enlarged. It was not necessary for us to burn every city, to destroy every factory, to shoot down every airplane or sink every ship, and starve the people. It was enough to demonstrate that we were capable of doing all this - that we had the power and the intention of continuing to the end. In this fashion, those responsible for the decision to surrender felt the twin-impact of our attack which made them not only impotent to resist, but also destroyed any hope of future resistance.

The will of the political leaders to resist collapsed well before the will of the people as a whole. The leaders were, however, unwilling to move too far in advance of public opinion. At the time of surrender, even though there was little pressure toward surrender from the people, their confidence in victory had been thoroughly undermined and they accepted the Imperial rescript, perhaps with surprise, but not with active resistance as some of the leaders had feared.

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One further point should be developed and stressed here. The political objective which existed in Japan lay exposed and vulnerable to air attack, which fact goes far toward explaining the true basis for unconditional surrender without invasion of the home islands. That vulnerability to air attack derived in part from the basic character of the war in its decisive phases. It turned out to be essentially a war to win air control over the Japanese homeland. This concept was not merely central to much of the strategy guiding our operations, but was thoroughly understood and feared by an effective sector of Japanese leaders who sought and achieved political power to terminate the war. By the Summer and Fall of 1944, and throughout the remainder of the war, the validity of their fear was being persuasively demonstrated by the application of our air power in its several roles. Loss of fleet and air forces, without which, as the leaders knew, no effective defense could be mounted, was almost entirely the result of our air superiority. Vital perimeter bases were lost when our air forces neutralized them, sealed off both air and sea reinforcement, and gave direct local support to our occupying operations. Japan's limited war production, already starved for materials through shipping lost to our submarines, was further depleted by air interdiction of sea communications as new bases eventually permitted almost complete blockade day and

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night. Heavy bomber and carrier raids against cities, military and industrial installations, further depleted her remaining resources, productivity and transport, lowered morale, and brought the true war situation home to the Japanese people. Thus the Japanese leaders lost both power and hope of resistance as our air weapons exploited air control over the home islands.

B. By relating them to the narrative set forth in the first sections of this report, it is possible to treat separately the principal contributions to surrender made by various factors which bore on the terminal events of the war.

1. Blockade of Japan's sea communications exploited the basic vulnerability of an island enemy which, with inherently second-power resources, was struggling to enlarge its capabilities by milking the raw materials of a rich conquered area. Acute dependence upon imports of such basic items as oil, iron ore, coal, bauxite, food, etc., caused Japan's shipping position even in the Fall of 1941 to appear deficient to several members of the Jushin, whose opinions were declared to TOJO before the Pearl Harbor attack. These fears were well-founded, at least for long-term fighting, since Japan began the war with 6,000,000 tons of merchant shipping, which were barely sufficient for estimated minimum requirements. Her capacity to build was quickly exceeded by losses. Eighty-eight percent

of Japan's total merchant shipping available during the war was sunk. U. S. submarines sank 55 per cent of the total lost. Our Navy and Army air forces made important contributions by sinking 40 per cent of Japan's total shipping lost, by interdiction of sea routes, and by an aerial mining program carried out by B-29s in the last months of the war which sealed off the vital Inland Sea and disrupted every major home island port. The blockade prevented exploitation of conquered resources, kept Japan's economy off balance, created shortages of materials which in turn limited war production, and deprived her of oil in amounts sufficient to immobilize fleet and air units and to impair training. These effects were intimately associated with the political conditions culminating in the fall of TOJO. The direct military and economic limitations imposed by shortages created virtually insoluble political as well as economic problems in attempting to achieve war production adequate for the defense of Japan. The special feeling of vulnerability to blockade, to which a dependent island people are ever subject, increased and dramatized, especially to the leaders, the hopelessness of their position and favored the growing conviction that the defeat was inevitable.

2. While the blockade was definitive in strangling Japan's war mobilization and production, it cannot be considered separately from the pressure of our concurrent military operations,

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with which it formed a shears that scissored Japan's military potential into an ineffectual remnant. In the early engagements that stemmed the Japanese advance and in the subsequent battle for bases, the application of our air power against vital forces which Japan committed piecemeal in defense of these perimeter positions enabled us largely to destroy her navy and reduce her air forces to impotence before the home islands could be brought under direct air attack. Throughout these operations we were employing air power effectively and potently in ways the Japanese leaders understood and feared, and had no adequate defense to withstand. Although a core of bitter-end resistance lay in Japan's army and navy until the Imperial rescript was signed, it should be noted that TOJO's collapse and the introduction of peace-making factions into the succeeding KOISO government quickly followed the loss of Saipan in July 1944. Also, after the costly and vitiating defeats in the Palau, Philippines and at Iwo Jima, KOISO was in turn succeeded shortly after our Okinawa landings of 1 April 1945 by the SUZUKI cabinet, which was formed with the specific mandate to terminate the war. In these campaigns, dictated by our need for air mastery and won by immediate air control, while Japan's loss of effective naval and land-based air forces was overwhelming, her military attrition was not complete, since our operations used up by no means all of her ground and Kamikaze forces. Japan's principal land armies were in fact never defeated, a consideration

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which also supported the military's continued last-ditch resistance to the surrender decision. It nevertheless appears that after the loss of the Marianas in July-August, 1944 the military commands, though unconvinced of final victory, viewed defense against our subsequent operations as affording an opportunity for only a limited success, a tactical victory which might, so they hoped, have created a purchase from which to try for a negotiated peace under terms more favorable than unconditional surrender.

3. Fear of home island bombing was persuasive to the political leaders even before its direct effects could be felt. News of the B-29 and its intended capabilities reached Japan in 1943. B-29 raids on Kyushu and Southern Honshu targets began from China bases on 15 June 1944. With the loss of Saipan in early July, 1944, many leaders became wholly convinced of Japan's eventual defeat, one factor being that from Marianas bases the homeland would be brought under the kind of intensive, shattering air assault even than being administered to their German partner. The timing of the strategic bombing attack affected its role in the surrender decision. After the Marianas were lost but before the first attacks were flown in November, 1944 TOJO had been unseated and peace-makers introduced into the government as prominent elements. The war economy had already passed its peak, fleet-

and air forces had been critically weakened, confidence of the "intelligensia" in the government and the military had been deflated, and confidence of the people in eventual victory was weakening. By mid-1944 shortages of food and civilian supplies were reflected in reduced living standards. Therefore the actual destruction wrought by strategic bombing assumed the role of an accelerator, to assist and expedite forces already in motion. It added a tremendous quantitative weight to those forces. Since the means of resisting direct air attacks had already been largely destroyed, it represented the full exploitation of air control by an air weapon. These attacks became definitive in the surrender decision because they broadened the realization of defeat by bringing it home to the people and dramatized to the whole nation what the small peace party already knew. They proved day in and day out, and night after night, that the United States did control the air and could exploit it. They lowered morale by demonstrating the disadvantages of total war directly, added a vital increment of both actual and clearly foreseeable future production loss by both precision and area attacks, and applied pressure on the surrender decision by eliminating the hope of successful final resistance.

4. When Japan was defeated without invasion, a recurrent question arose as to what effect the threat of

a home island invasion had had upon the surrender decision. It was contended that the threat of invasion, if not the actual operation, was a requirement to induce acceptance of the surrender terms. On this tangled issue the evidence and hindsight are clear. The fact is, of course, that Japan did surrender without invasion, and with its principal armies intact. Testimony before the Survey shows that the expected "violation of the sacred homeland" raised few fears which expedited the decision to surrender beforehand. Government and Imperial household leaders felt some concern for the "destruction of the Japanese people", but the people were already being shattered by direct air attacks. Anticipated landings were even viewed by the military with hope that they would afford a means of inflicting casualties sufficiently high to improve their chances of a negotiated peace. Preparation of defenses against landings diverted certain resources from dispersal and cushioning moves which might have partially mitigated our air blows. But in Japan's then depleted state, the diversion was not significant. The responsible leaders in power read correctly the true situation and embraced surrender well before invasion was expected.

5. So long as Germany remained in the war that fact contributed to the core of Japanese resistance. Slight

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evidence exists that some hope was held for a long-promised German miracle weapon. A telegram received on 6 May in the German embassy at Tokyo revealed that Hitler was dead, the promised new weapon had failed to materialize and that Germany would surrender within a matter of hours. KIDO believed, presumably on Japanese Army representations, that the Army would not countenance peace moves so long as Germany continued to fight. It is not clear whether this was a face-saving position, designed to avoid a prior Japanese surrender. In any case on 9 May 1945, immediately after the Nazi capitulation, General ANAMI, the War Minister, asked the cabinet for an Imperial conference to reconsider the war situation. The significant fact, however, is that Japan was pursuing peace before the Nazis collapsed, and the impoverishment and fragmentation of the German people had already afforded a portent of similar consequences for an intransigent Japan.

6. The Hiroshima and Nagasaki atomic bombs did not defeat Japan, nor by the testimony of the enemy leaders who ended the war did they persuade Japan to accept unconditional surrender. The Emperor, the lord privy seal, the prime minister, the foreign minister and the navy minister had decided as early as May of 1945 that the war should be ended even if it meant acceptance of defeat on allied terms.

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The war minister and the two chiefs of staff opposed unconditional surrender. The impact of the Hiroshima attack was to bring further urgency and lubrication to the machinery of achieving peace, primarily by contributing to a situation which permitted the prime minister to bring the Emperor overtly and directly into a position where his decision for immediate acceptance of the Potsdam declaration could be used to override the remaining objectors. Thus, although the atomic bombs changed no votes of the Supreme War Direction Council concerning the Potsdam terms, they did foreshorten the war and expedite the peace.

Events and testimony which support these conclusions are blue-printed from the chronology established in the first sections of this report.

a. The mission of the SUZUKI government, appointed 7 April 1945, was to make peace. The position of negotiating for terms less onerous than unconditional surrender was maintained in order to contain the military and bureaucratic elements still determined on a final Bushido defense, and perhaps even more importantly to obtain freedom to create peace with a minimum of personal danger and internal obstruction. It seems clear however that in extremis the peacemakers would have peace, and peace on any terms. This was the gist of advice given to Hirohito by the Jushin in February, the declared conclusion of KIDO in April, the underlying reason for KIDO's fall in April, the specific injunction of the Emperor

to SUZUKI on becoming premier which was known to all members of his cabinet.

b. A series of conferences of the Supreme War Direction Council before Hirohito on the subject of continuing or terminating the war began on 8 June and continued through 14 August. At the 8 June meeting the war situation was reviewed. On 20 June the Emperor, supported by the premier, foreign minister and Navy minister, declared for peace; the army minister and the two chiefs of staff did not concur. On 10 July the Emperor again urged haste in the moves to mediate through Russia, but Potsdam intervened. While the government still awaited a Russian answer, the Hiroshima bomb was dropped on 6 August.

c. Consideration of the Potsdam terms within the Supreme War Direction Council revealed the same three-to-three cleavage which first appeared at the Imperial conference on 20 June. On the morning of 9 August Premier SUZUKI and Hirohito decided at once to accept the Potsdam terms; meetings and moves thereafter were designed to legalize the decision and prepare the Imperial rescript. At the conclusive Imperial conference, on the night of 9-10 August, the Supreme War Direction Council still split three-to-three. It was necessary for the Emperor finally to repeat his desire for acceptance of the Potsdam terms.

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d. Indubitably the Hiroshima bomb and the rumor derived from interrogation of an American prisoner (B-29 pilot) who stated that an atom bomb attack on Tokyo was scheduled for 12 August introduced urgency in the minds of the government and magnified the pressure behind its moves to end the war.

7. The sequence of events just recited also defines the effect of Russia's entry into the Pacific war on 8 August 1945. Coming two days after the Hiroshima bomb, the move neither defeated Japan nor materially hastened the acceptance of surrender nor changed the votes of the Supreme War Direction Council. Negotiation for Russia to intercede began the forepart of May 1945 in both Tokyo and Moscow. KONOYE, the intended emissary to the Soviets, stated to the Survey that while ostensibly he was to negotiate, he received direct and secret instructions from the Emperor to secure peace at any price, notwithstanding its severity. SAKOMIZU, the chief cabinet secretary, alleged that while awaiting the Russian answer on mediation, SUZUKI and TOGO decided that were it negative direct overtures would be made to the United States. Efforts toward peace through the Russians, forestalled by the imminent departure of Stalin and Molotov for Potsdam, were answered by the Red Army's advance into Manchuria. The Kwantung army, already weakened by diversion of its units

and logistics to bolster island defenses in the South and written off for the defense of Japan proper, faced inescapable defeat.

There is little point in attempting more precisely to impute Japan's unconditional surrender to any one of the numerous causes which jointly and cumulatively were responsible for Japan's disaster. Concerning the absoluteness of her defeat there can be no doubt. The time lapse between military impotence and political acceptance of the inevitable might have been shorter had the political structure of Japan permitted a more rapid and decisive determination of national policies. It seems clear, however, that air supremacy and its exploitation over Japan proper was the major factor which determined the timing of Japan's surrender and obviated any need for invasion.

Based on a detailed investigation of all the facts and supported by the testimony of the surviving Japanese leaders involved, it is the Survey's opinion that certainly prior to 31 December 1945, and in all probability prior to 1 November 1945, Japan would have surrendered even if the atomic bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated.

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APPENDIX

SURVEY OF NATIONAL RESOURCES

AS OF 1-10 JUNE 1945

The following is a translation of the Japanese estimate prepared for the pre-surrender deliberations of the cabinet, and referred to on page 19 of this report.

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APPENDIX

SURVEY OF NATIONAL RESOURCES AS OF

1 - 10 JUNE 1945

A. General

The ominous turn of the war, coupled with the increasing tempo of air raids is bringing about great disruption of land and sea communications and essential war production. The food situation has worsened. It has become increasingly difficult to meet the requirements of total war. Moreover, it has become necessary to pay careful attention to the trends in public sentiment.

B. National Trends in General

Morale is high, but there is dissatisfaction with the present regime. Criticisms of the government and the military are increasing. The people are losing confidence in their leaders, and the gloomy omen of deterioration of public morale is present. The spirit of public sacrifice is lagging and among leading intellectuals there are some who advocate peace negotiations as a way out. It is necessary at this time to make careful preparations to cope with public reactions in case the Okinawa campaign results in a disaster and to provide proper indoctrination against such an eventuality. Moreover, it is to be expected that in the future the enemy's psychological warfare will intensify.

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C. Manpower

1. As compared with material resources, there is a relative surplus of manpower, but there is no efficient exploitation of it. Although distribution and mobilization of manpower do not respond to shifting of production, there is still room for increasing war potential depending on its efficient application. On the other hand, the case of military mobilization does not permit optimism.

2. The physical standard and birth rate of the people are on the down grade.

Notes:

a. Surplus manpower

Industry - 2,000,000

Commerce - 500,000

Others - 500,000

There is a reserve of 3,000,000. At present effort is being made to apply this surplus to agriculture and transportation where shortages exist.

b. Mobilization and distribution of manpower

Workers available for various industries in December 1944 (between the ages of 16 to 60):

Male - 20,300,000

Female - 24,000,000

Total - 44,300,000 (37,500,000 already engaged in industries and armed forces)

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c. Rate of population increase per 1000

After 1940, there is a yearly increase of approximately 1,000,000.

1940 - 12.7

1941 - 15.2

1942 - 14.2

1943 - 13.8

1944 - Figures unknown. It is estimated that since birth rate decreased and infant mortality increased, the figure is lower than that of the previous year.

C. Transportation and Communications

1. Transportation and Shipping

The volume of available shipping space was sharply reduced and at present comes to a total of one million tons. Transportation is faced with insurmountable difficulties because of fuel shortages, mounting fury of enemy attacks on our lines of communication, and insufficient manpower in cargo handling.

The question of whether or not we can maintain communication with the continent will greatly depend upon the results of the Okinawa campaign. If the campaign turns to our disadvantage, we cannot hope to maintain planned communication after June. For the same reason, the cargo-carrying capacity of vessels will drastically decrease.

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Notes:	<u>Shipping</u>			
Dec 1941	-	5,500,000	gross tons	
Dec 1942	-	4,600,000	"	"
Dec 1943	-	3,700,000	"	"
Jul 1944	-	3,100,000	"	"
Apr 1945	-	1,250,000	"	"

Actual Losses

Previous average	-	7 to 10 per cent
This year	-	23 per cent

2. Transportation and railways

Transport capacity of the railways will drop to half that of the previous year due to the intensified enemy air attack and our inability to maintain construction and repairs on an efficient level. It is feared that railway transportation will become confined to local areas, especially after the middle of this year.

Shuttle transports (trucks, wagons, etc) and cargo handling here become the bottleneck of land and sea transportation, because of the scarcity of fuel and labor.

Notes: Railway Transport Capacity

1941	-	150,000,000	tons
1942	-	160,000,000	"
1943	-	180,000,000	"
1944	-	190,000,000	"
1945	-	90,000,000	" (projected)

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3. Communications

Maintenance of communication will be exceedingly difficult after the middle of this year, because of enemy air raid damage and shortages of materials and personnel.

E. Material Resources

1. Steel

Shipping of iron ore has become difficult. The total production is about one-fourth that of the same period of the previous year. Construction of steel ships cannot be expected after mid-year. Even a shift to the use of existing materials would mean overcoming numerous obstacles before the plan could be executed.

Notes: Steel Production

1941	-	4,200,000 tons
1942	-	4,100,000 "
1943	-	4,200,000 "
1944	-	2,700,000 "
1945	-	270,000 " (projected for first quarter)

2. Coal

Accompanying the increasing severity of air raids and reduction in transport capacity and production, there is a strong possibility that a considerable portion of the various industrial areas will have to suspend operation for lack of coal.

3. Industrial salts

Shipping from the continent has decreased and production

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of chemicals, which is dependent on soda, is falling off at an alarming rate. After the middle of this year, we will be confronted with a shortage of basic salts. For this reason, not only will there be difficulty in producing light metals and synthetic oil, but also in producing explosives.

Notes: In the first quarter of 1945, the objective was to obtain 460,000 tons, but the actual result was approximately 40 per cent.

Aluminum Production

1941	-	73,000	tons
1942	-	110,000	"
1943	-	140,000	"
1944	-	110,000	"
1945	-	9,000	" (projected for first quarter)

4. Liquid fuel

Hereafter Japan, Manchuria and China will have to depend upon their own sources for fuel oil. With oil reserves on the verge of exhaustion and the delay in plans for increased output of oil, we are faced with an extreme shortage of aviation fuel. This, of course, will have a serious effect on the planning of future operations, especially after the mid-year.

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Notes:

Production (unit - 1000 Kl)

Storage (unit - 1000 kl)

Year	Various types of fuel processed	Crude oil	Period	Various Types of fuel processed	Crude oil
1941	3,470	1,570	Apr 1941	4,457	3,562
1942	3,020	1,256	Apr 1942	4,115	1,963
1943	3,460	1,969	Apr 1943	2,940	1,220
1944	2,053	734	Apr 1944	1,822	558
1945	1,362	330	Apr 1945	752	779

5. Modern weapons with aircraft as a nucleus

It is becoming increasingly difficult to maintain production of aircraft due to the ever increasing tempo of air raids, the destruction of transportation systems and production facilities, and the lack of raw materials and fuels.

Notes: Production of Aircraft

1944	- monthly production	- 2,230
1945	- April	- 1,800
1945	- May	- 1,600

F. National Living Conditions

1. Foodstuffs

The food situation has grown worse and a crisis will be

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reached at the end of this year. The people will have to get along on an absolute minimum of rice and salt required for subsistence, considering the severity of air raids, difficulties in transportation, and the appearance of starvation conditions in the isolated sections of the nation. It is apparent that the food situation will become further aggravated this year.

2. Living conditions

From now on prices will rise sharply bringing on inflation which will seriously undermine the wartime economy.

Notes: Anticipated supply and demand of rice for 1945
(estimate made 1 - 10 June)

TN: 1 koku = 4.96 bushels

- a. Estimated supply, Japan proper - 77,165,000 koku
- b. Estimated demand - 84,258,000 koku
- c. Estimated imports from Manchuria and Korea - 4,250,000 koku. (It will become increasingly difficult to realize this figure, depending upon air raids.)

Deficiencies will be alleviated with military rice and by placing restrictions on rice distribution.

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U. S. Strategic Bombing Survey

THE EFFECTS OF
THE ATOMIC BOMBINGS
OF
HIROSHIMA AND NAGASAKI

CHAIRMAN'S OFFICE



19 June 1946

B F

THE UNITED STATES
STRATEGIC BOMBING SURVEY



THE EFFECTS OF
THE ATOMIC BOMBINGS
OF
HIROSHIMA AND NAGASAKI

CHAIRMAN'S OFFICE

19 June 1946

FOREWORD

The United States Strategic Bombing Survey was established by the Secretary of War on 3 November 1944, pursuant to a Directive from the late President Roosevelt. Its mission was to conduct an impartial and expert study of the effects of our aerial attack on Germany, to be used in connection with air attacks on Japan and to establish a basis for evaluating the importance and potentialities of air power as an instrument of military strategy, for planning the future development of the United States armed forces, and for determining future economic policies with respect to the national defense. A summary report and some 200 supporting reports containing the findings of the Survey in Germany have been published.

On 15 August 1945, President Truman requested that the Survey conduct a similar study of the effects of all types of air attack in the war against Japan, submitting reports in duplicate to the Secretary of War and to the Secretary of the Navy. The officers of the Survey during its Japanese phase were:

Franklin D'Olier, Chairman
Paul H. Nitze, Henry C. Alexander, Vice-Chairmen
Walter Wilds, Secretary
Harry L. Bowman
J. K. Galbraith
Rensis Likert
Frank A. McNamee
Fred Searls, Jr.
Monroe Spaght
Dr. Louis R. Thompson
Theodore P. Wright, Directors.

The Survey's complement provided for 300 civilians, 350 officers, and 500 enlisted men. The military segment of the organization was drawn from the Army to the extent of 60 percent, and from the Navy to the extent of 40 percent. Both the Army and Navy gave the Survey all possible assistance in furnishing men, supplies, transport, and information. The Survey operated from headquarters in Tokyo early in September, 1945, with sub-headquarters in Nagoya, Osaka, Hiroshima, and Nagasaki, and with mobile teams operating in other parts of Japan, the islands of the Pacific and the Asiatic mainland.

It was possible to reconstruct much of wartime Japanese military planning and execution engagement by engagement and campaign

by campaign, and to secure reasonably accurate statistics on Japan's economy and war-production plant by plant, and industry by industry. In addition, studies were conducted on Japan's overall strategic plans and the background of her entry into the war, the internal discussions and negotiations leading to her acceptance of unconditional surrender, the course of health and morale among the civilian population, the effectiveness of the Japanese civilian defense organization and the effects of the atomic bombs. Separate reports will be issued covering each phase of the study.

The Survey interrogated more than 700 Japanese military, government and industrial officials. It also recovered and translated many documents which have not only been useful to the Survey, but will also furnish data valuable for other studies. Arrangements are being made to turn over the Survey's files to a permanent government agency where they will be available for further examination and distribution.

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I.

INTRODUCTION

The available facts about the power of the atomic bomb as a military weapon lie in the story of what it did at Hiroshima and Nagasaki. Many of these facts have been published, in official and unofficial form, but mingled with distortions or errors. The U. S. Strategic Bombing Survey, therefore, in partial fulfillment of the mission for which it was established, has put together in these pages a fairly full account of just what the atomic bombs did at Hiroshima and Nagasaki. Together with an explanation of how the bomb achieved these effects, this report states the extent and nature of the damage, the casualties, and the political repercussions from the two attacks. The basis is the observation, measurement, and analysis of the Survey's investigators. The conjecture that is necessary for understanding of complex phenomena and for applying the findings to the problems of defense of the U.S. is clearly labelled.

When the atomic bombs fell, the U.S. Strategic Bombing Survey was completing a study of the effects of strategic bombing on Germany's ability and will to resist. A similar study of the effects of strategic bombing on Japan was being planned. The news of the dropping of the atomic bomb gave a new urgency to this project, for a study of the air war against Japan clearly involved new weapons and new possibilities of concentration of attack that might qualify or even change the conclusions and recommendations of the Survey as to the effectiveness of air power. The directors of the Survey, therefore, decided to examine exhaustively the effects of the atomic bombs, in order that the full impact on Japan and the implications of their results could be confidently analyzed. Teams of experts were selected to study the scenes of the bombings from the special points of emphasis of physical damage, civilian defense, morale, casualties, community life, utilities and transportation, various industries, and the general economic and political repercussions. In all, more than 110 men - engineers, architects, fire experts, economists, doctors, photographers, draftsmen - participated in the field study at each city, over a period of ten weeks from October to December, 1945. Their detailed studies, now being published, are listed in an appendix to this summary report.

In addition, close liaison was maintained with other investigating units. Cooperation was received from, and extended to, the following groups:

The Joint Commission for the Investigation of the Atomic Bomb in Japan

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The British Mission to Japan

The Naval Technical Mission to Japan

Special acknowledgement is due to the medical groups of the Joint Commission, whose data and findings have been generously made available to the Survey. On medical aspects of the bombings, the Joint Commission was the chief fact-finding group; it will present its definitive report in the near future. In other fields, however -- particularly the study of physical damage and the impact on community life -- the Survey collected its own data and is the primary source.

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enthusiastic air raid precautions. Previously, a general alert had been sounded at 0748, with a raid alert at 0750; this was cancelled at 0830, and the alertness of the people was dissipated by a great feeling of relief."

The city remained on the warning alert, but when two B-29's were again sighted coming in the raid signal was not given immediately; the bomb was dropped at 1102 and the raid signal was given a few minutes later, at 1109. Thus only about 400 people were in the city's tunnel shelters, which were adequate for about 30 per cent of the population.

"When the atomic bomb exploded, an intense flash was observed first, as though a large amount of magnesium had been ignited, and the scene grew hazy with white smoke. At the same time at the center of the explosion, and a short while later in other areas, a tremendous roaring sound was heard and a crushing blast wave and intense heat were felt. The people of Nagasaki, even those who lived on the outer edge of the blast, all felt as though they had sustained a direct hit, and the whole city suffered damage such as would have resulted from direct hits everywhere by ordinary bombs."

"The Zero area where the damage was most severe was almost completely wiped out and for a short while after the explosion no reports came out of that area. People who were in comparatively damaged areas reported their condition under the impression that they had received a direct hit. If such a great amount of damage could be wreaked by a near miss, then the power of the atomic bomb is unbelievably great."

In Nagasaki, no fire storm arose, and the uneven terrain of the city confined the maximum intensity of damage to the valley over which the bomb exploded. The area of nearly complete devastation was thus much smaller: only about 1.8 square miles. Casualties were lower also; between 35,000 and 40,000 were killed, and about the same number injured. People in the tunnel shelters escaped injury, unless exposed in the entrance shaft.

The difference in the totals of destruction to lives and property at the two cities suggests the importance of the special circumstances of layout and construction of the cities, which affect the results of the bombings and must be considered in evaluating the effectiveness of the atomic bombs. An account of the nature and history of each city will give meaning to the details of the damage and disorganization at each.

2. HIROSHIMA.

The city of Hiroshima is located on the broad fan-shaped delta of the Ota River, whose seven mouths divide the city into six

islands which project finger-like into Hiroshima Bay of the Inland Sea. These mouths of the river furnished excellent firebreaks in a city that is otherwise flat and only slightly above sea level. A highly developed bridge system, with 81 important bridges, joined the islands. A single kidney shaped hill in the eastern part of the city, about one-half mile long and rising to an elevation of 221 feet, offered some blast protection to structures on the eastern side opposite the point of fall of the bomb. Otherwise, the city was uniformly exposed to the spreading energy from the bomb.

The city boundary extends to some low hills to the west and northeast and embraces 26.36 square miles, only thirteen of which were built up. Seven square miles were densely or moderately built up, the remainder being occupied by sparsely built-up residential, storage, and transportation areas, vegetable farms, water courses, and wooded hilly sections. In the central area, no systematic separation of commercial, industrial, and residential zones existed, though there were rough functional sections. The main commercial district was located in the center of the city, and with the adjoining Chugoku Regional Army Headquarters occupied the greater portion of the central island. Residential areas and military barracks overlapped and surrounded this central area. The bulk of the industries were located on the perimeter of the city, either on the southern ends of the islands (where the Hiroshima airport was also situated) or to the east of the city. The four square miles of densely built-up area in the heart of the city -- residential, commercial, and military -- contained 75 percent of the total population. If there were, as seems probable, about 245,000 people in the city at the time of the attack, the density in the congested area must have been about 46,000 per square mile. Five completed evacuation programs and a sixth then in progress had reduced the population from its wartime peak of 380,000.

In Hiroshima (and in Nagasaki also) the dwellings were of wood construction; about one-half were one story and the remainder either one and one-half or two stories. The roof coverings were mostly hard-burnt black tile. There were no masonry division walls, and large groups of dwellings clustered together. The type of construction, coupled with antiquated fire-fighting equipment and inadequately trained personnel, afforded even in peacetime a high possibility of conflagration. Many wood framed industrial buildings were of poor construction by American standards. The principal points of weakness were the extremely small tenons, the inadequate tension joints, and the inadequate or poorly designed lateral bracings. Reinforced concrete framed buildings showed a striking lack of uniformity in design and in quality of materials. Some of the construction details (reinforcing rod splices, for example) were often poor, and much of the concrete was definitely weak; thus some reinforced concrete buildings collapsed and suffered structural damage when within 2,000 feet of ground zero, and some internal wall paneling was demolished even up to 3,800 feet. (For convenience, the term "ground zero" will be used to designate the point on the ground directly beneath the point of detonation, or "air zero".)

Other buildings, however, were constructed far more strongly than is required by normal building codes in America, to resist earthquakes. Furthermore, construction regulations in Japan have specified since the 1923 earthquake that the roof must safely carry a minimum load of 70 pounds per square foot whereas American requirements do not normally exceed 40 pounds per square foot for similar types. Though the regulation was not always followed, this extra strong construction was encountered in some of the buildings near ground zero at Hiroshima, and undoubtedly accounts for their ability to withstand atomic bomb pressures without structural failures. Nearly 7 percent of the residential units had been torn down to make firebreaks.

Hiroshima before the war was the seventh largest city in Japan, with a population of over 340,000, and was the principal administrative and commercial center of the southwestern part of the country. As the headquarters of the Second Army and of the Chugoku Regional Army, it was one of the most important military command stations in Japan, the site of one of the largest military supply depots, and the foremost military shipping point for both troops and supplies. Its shipping activities had virtually ceased by the time of the attack, however, because of sinkings and the mining of the Inland Sea. It had been relatively unimportant industrially before the war, ranking only twelfth, but during the war new plants were built that increased its significance. These factories were not concentrated, but spread over the outskirts of the city; this location, we shall see, accounts for the slight industrial damage.

The impact of the atomic bomb shattered the normal fabric of community life and disrupted the organizations for handling the disaster. In the 30 percent of the population killed and the additional 30 percent seriously injured were included corresponding proportions of the civic authorities and rescue groups. A mass flight from the city took place, as persons sought safety from the conflagration and a place for shelter and food. Within 24 hours, however, people were streaming back by the thousands in search of relatives and friends and to determine the extent of their property loss. Road blocks had to be set up along all routes leading into the city, to keep curious and unauthorized people out. The bulk of the dehouzed population found refuge in the surrounding countryside; within the city the food supply was short and shelter virtually non-existent.

On August 7, the commander of the Second Army assumed general command of the counter-measures, and all military units and facilities in the area were mobilized for relief purposes. Army buildings on the periphery of the city provided shelter and emergency hospital space, and dispersed Army supplies supplemented the slight amounts of food and clothing that had escaped destruction. The need far exceeded what could be made available. Surviving civilians assisted; although casualties in both groups had been heavy, 190 policemen and over 2000 members of the Civilian Defense Corps reported for duty on

7 August.

The status of medical facilities and personnel dramatically illustrates the difficulties facing authorities. Of more than 200 doctors in Hiroshima before the attack, over 90 percent were casualties and only about 30 physicians were able to perform their normal duties a month after the raid. Out of 1,780 nurses, 1,654 were killed or injured. Though some stocks of supplies had been dispersed, many were destroyed. Only three out of 45 civilian hospitals could be used, and two large Army hospitals were rendered unusable. Those within 3,000 feet of ground zero were totally destroyed, and the mortality rate of the occupants was practically 100 percent. Two large hospitals of reinforced concrete construction were located 4,900 feet from ground zero. The basic structures remained erect but there was such severe interior damage that neither was able to resume operation as a hospital for sometime and the casualty rate was approximately 90 percent, due primarily to falling plaster, flying glass, and fire. Hospitals and clinics beyond 7,000 feet, though often remaining standing, were badly damaged and contained many casualties from flying glass or other missiles.

With such elimination of facilities and personnel, the lack of care and rescue activities at the time of the disaster is understandable; still, the eyewitness account of Father Siemes* shows how this lack of first aid contributed to the seriousness of casualties. At the improvised first aid stations, he reports:

"...Iodine is applied to the wounds but they are left uncleansed. Neither ointment nor other therapeutic agents are available. Those that have been brought in are laid on the floor and no one can give them any further care. What could one do when all means are lacking? Among the passersby, there are many who are uninjured. In a purposeless, insensate manner, distraught by the magnitude of the disaster, most of them rush by and none conceives the thought of organizing help on his own initiative. They are concerned only with the welfare of their own families--in the official aid stations and hospitals, a good third or half of those that had been brought in died. They lay about there almost without care, and a very high percentage succumbed. Everything was lacking, doctors, assistants, dressings, drugs, etc..."

Effective medical help had to be sent in from the outside, and arrived only after a considerable delay.

Fire fighting and rescue units were equally stripped of men and equipment. Father Siemes reports that 30 hours elapsed before any organized rescue parties were observed. In Hiroshima, only 16 pieces of fire-fighting equipment were available for fighting the

* German-born Jesuit professor at Jochi University, Tokyo; in the Hiroshima area when the bomb fell.

conflagration, three of them borrowed. However, it is unlikely that any public fire department in the world, even without damage to equipment or casualties to personnel, could have prevented development of a conflagration in Hiroshima, or combatted it with success at more than a few locations along its perimeter. The total fire damage would not have been much different.

All utilities and transportation services were disrupted over varying lengths of time. In most cases, however, the demand fell off even more precipitously than the available supply, and where the service was needed it could be restored at a minimal level. Thus, through railroad service was possible on 8 August, only two days after the attack, when fire trucks still had to be used to pump water into the locomotives because of insufficient water pressure. Electric power from the general network was available in most of the surviving parts of the city on 7 August, and only one plant, the Engineering Division of Mitsubishi Heavy Industries, was hampered in its recovery by the inability to obtain sufficient power for several weeks.

The water reservoir, which was of reinforced concrete and earthcovered, was undamaged; it was nearly two miles from the blast center. However, 70,000 breaks of pipe connections in buildings and dwellings were caused by blast and fire effects. No subsurface pipes were crushed and no leaks resulted from blast as a direct cause, though several leaks in underground mains resulted from falling debris. Pressure in the city center dropped to zero because of the connection breaks and the damage to a 16-inch and a 14-inch water main where they crossed damaged bridges. Six sewer pumping stations were rendered inoperable by fire and blast within a radius of one mile. The remaining eight stations were only slightly damaged, but no effort was made to repair or operate them. Water tables rose at flood periods and lands behind revetments were inundated.

Trolley cars, trucks, and railroad rolling stock suffered extensive damage. Transportation buildings (offices, stations, living quarters, and a few warehouses) were damaged by fire in the passenger station area, but damage was slight to the roundhouses, transit sheds, warehouses, and repair units in the classification and repair area. About 200 railroad employees were killed, but by 20 August, 14 days after the attack, 80 percent of the employees were at work.

The electric power transmission and distribution system was wrecked; only power equipment of rugged construction, such as transformers, resisted the blast and heat within the devastated areas. Instruments were damaged beyond repair, and switches, switchyard insulators, cables, and copper bus work were rendered unusable. The telephone system was approximately 80 percent damaged, and no service was restored until 15 August 1945.

Industry in the center of the city was effectively wiped

out. Though small workshops numbered several thousand, they represented only one-fourth of the total industrial production of Hiroshima, since many of them had only one or two workers. The bulk of the city's output came from large plants located on the outskirts of the city: one-half of the industrial production came from only five firms. Of these larger companies, only one suffered more than superficial damage. Of their working force, 94 percent were uninjured. Since electric power was available, and materials and working force were not destroyed, plants ordinarily responsible for nearly three-fourths of Hiroshima's industrial production could have resumed normal operation within 30 days of the attack had the war continued.

Immediately after the attack, the presence of these nearly intact industries spurred counter-measures in an effort to retain for the nation's war effort the potential output of the city. The prefec-tural governor issued a proclamation on 7 August, calling for "a rehab-ilitation of the stricken city and an aroused fighting spirit to exterminate the devilish Americans". To prevent the spread of rumors and brace morale, 210,000 out-of-town newspapers were brought in daily to replace the destroyed local paper. With the surrender, however, recon-struction took on a slower tempo. On 16 August, regular rationing was resumed. Care of the injured and disposal of corpses remained urgent, but other steps were few.

By 1 November, the population of Hiroshima was back to 137,000. The city required complete rebuilding. The entire heart, the main administrative and commercial as well as residential section, was gone. In this area only about fifty buildings, all of reinforced concrete, remained standing. All of these suffered blast damage and all save about a dozen were almost completely gutted by fire; only five could be used without major repairs. These burnt-out structural frames rose impressively from the ashes of the burned over section where occa-sional piles of rubble or twisted steel skeletons marked the location of brick or steel frame structures. At greater distances light steel frame and brick structures remained undamaged. Blast damage to wood frame buildings and to residences extended well beyond the burned over area, gradually becoming more erratic and spotty as distances were reached where only the weakest buildings were damaged, until in the outer portions of the city only minor disturbances of the tile roofs or breakage of glass were visible. The official Japanese figures summed up the building destruction at 62,000 out of a total of 90,000 buildings in the urban area, or 69%. An additional 6,000 or 6.6% were severely damaged, and most of the others showed glass breakage or disturbance of roof tile. These figures show the magnitude of the problem facing the survivors.

Despite the absence of sanitation measures, no epidemics are reported to have broken out. In view of the lack of medical facil-ities, supplies and personnel, and the disruption of the sanitary sys-tem, the escape from epidemics may seem surprising. The experience of

other bombed cities in Germany and Japan shows that this is not an isolated case. A possible explanation may lie in the disinfecting action of the extensive fires. In later weeks, disease rates rose, but not sharply.

3. Nagasaki.

Nagasaki is located on the best natural harbor of western Kyushu, a spacious inlet in the mountainous coast. The city is a highly congested urban pattern extending for several miles along the narrow shores and up the valleys opening out from the harbor. Two rivers, divided by a mountain spur, form the two main valleys in whose basins the city lies: the Urakami River, in whose basin the atomic bomb fell, running into the harbor from a NNW direction, and the Nakashima River, running from the NE. This mountain spur and the irregular lay-out of the city effectively reduced the area of destruction.

The main residential and commercial districts are intermingled in these two river basins. The large industrial plants stretch up the west shore of the bay and up the Urakami Valley. Though the metropolitan area of the city is officially about 35 square miles and stretches far into the countryside, the heavily built-up area is confined by the terrain to less than four square miles. The greatest population density thus approximated 65,000 per square mile even after the evacuations.

Despite its excellent harbor, Nagasaki's commercial importance, though great in previous centuries, had declined in recent years because of the city's isolated peninsular position and the difficulties of transportation through the mountains by inadequate roads and railroad facilities. As a naval base it had been supplanted by Sasebo. Industry gradually increased in importance; primarily under Mitsubishi influence. The four largest companies in the city were the Mitsubishi Shipyards, Electrical Equipment Works, Arms Plant, and Steel Works, employing nearly 90 percent of the city's labor force. Administratively, Nagasaki was by 1941 of merely local importance despite being the seat of the prefectural government.

Before the atomic bombing on 9 August, Nagasaki had experienced five small-scale air attacks in the previous twelve months, by an aggregate of 136 planes which dropped a total of 270 tons of high explosive, 53 tons of incendiary, and 20 tons of fragmentation bombs.

Of these, a raid of 1 August 1945 was most effective, with several bombs falling in the Mitsubishi Shipyards and Steel Works. The scale of effect can be roughly measured, however, by comparing the toll of building damage with that from the atomic bomb; in all these raids 276 residential buildings and 21 industrial buildings were destroyed or badly damaged. When the atomic bomb fell, Nagasaki was comparatively intact.

Because the most intense destruction was confined to the Urakami Valley, the impact of the bomb on the city as a whole was less shattering than at Hiroshima. In addition, no fire storm occurred; indeed, a shift in wind direction helped control the fires. Medical personnel and facilities were hard-hit, however. Over 80 percent of the city's hospital beds and the Medical College were located within 3,000 feet of the center of the explosion, and were completely destroyed. Reinforced concrete buildings within this range, though standing, were completely gutted by fire; buildings of wooden construction were destroyed by fire and blast. The mortality rate in this group of buildings was between 75 and 80 percent. Exact casualty figures for medical personnel are unknown, but the city seems to have fared better than Hiroshima: 120 doctors were at work on 1 November, about one-half of the pre-raid roster. Casualties were undoubtedly high: 600 out of 850 medical students at the Nagasaki Medical College were killed and most of the others injured; and of the 20 faculty members 12 were killed and four others injured.

Utilities and services were again disrupted. Both gas plants were destroyed, and the replacement time was estimated at several months. Though the basic water supply was not affected, thousands of residential feeder-line breaks were supplemented by eight breaks on a fourteen-inch main line and four breaks where another main line crossed a bridge. Electric power distribution and transmission systems were effectively destroyed in the area of heaviest destruction, but power could be supplied to the other parts of the city almost immediately.

Shipping was virtually unaffected. Trolley service was halted both by the interruption in power supply and by damage to street cars. Nagasaki is at the end of a railroad spur line. The major damage was sustained by track and railroad bridges. The rails buckled intermittently for a distance of 5,000 to 7,500 feet from ground zero, at points where burning debris set fire to wooden cross ties. Three bridges were displaced; rails were distorted and the tracks had to be completely rebuilt. The railroad stations were completely destroyed by blast and fire and the electric signal system was severely damaged. Rolling stock was slightly damaged, primarily by fire. Although the damage to equipment was not extensive, it was severe enough to curtail traffic for 48 hours, during which time sufficient emergency repair work was performed to permit resumption of limited traffic.

Control of relief measures was in the hands of the Prefecture. The sequence of clearance and repair activities illustrates the activities that were carried on.

The city's repair facilities were completely disorganized by the atomic bomb, so that with the single exception of shutting off water to the affected areas no repairs were made to roads, bridges, water mains, or transportation installations by city forces. The prefecture took full responsibility for such restoration as was accomplished,

delegating to the scattered city help the task of assisting in relief of victims. There were only three survivors of 115 employees of the street car company, and late as the middle of November 1945 no cars were running. A week after the explosion, the water works officials made an effort to supply water to persons attempting to live in the bombed out areas, but the leakage was so great that the effort was abandoned. It fell to the prefecture, therefore, to institute recovery measures even in those streets normally the responsibility of the city. Of the entire public works construction group covering the Nagasaki City area, only three members appeared for work and a week was required to locate and notify other survivors. On the morning of 10 August, police rescue units and workers from the Kawami-nami shipbuilding works began the imperative task of clearing the Omura-Nagasaki pike, which was impassable for 8,000 feet. A path 6½ feet wide was cleared despite the intense heat from smouldering fires, and by August 15 had been widened to permit two-way traffic. No trucks, only rakes and shovels, were available for clearing the streets, which were filled with tile, bricks, stone, corrugated iron, machinery, plaster, and stucco. Street areas affected by blast and not by fire were littered with wood. Throughout the devastated area, all wounded had to be carried by stretcher, since no motor vehicles were able to proceed through the cluttered streets for several days. The plan for debris removal required clearance of a few streets leading to the main highway; but there were frequent delays caused by the heat of smouldering fires and by calls for relief work. The debris was simply raked and shoveled off the streets. By 20 August the job was considered complete. The streets were not materially damaged by the bomb nor were the surface or the abutments of the concrete bridges, but many of the wooden bridges were totally or partially destroyed by fire.

Under the circumstances -- fire, flight of entire families, destruction of official records, mass cremation--identification of dead and the accurate count of casualties was impossible. As at Hiroshima, the season of the year made rapid disposal of bodies imperative, and mass cremation and mass burial were resorted to in the days immediately after the attack. Despite the absence of sanitary measures, no epidemics broke out here. The dysentery rate rose from 25/100,000 to 125/100,000. A census taken on 1 November 1945 found a population of 142,700 in the city.

At Nagasaki, the scale of destruction was greater than at Hiroshima, though the actual area destroyed was smaller because of the terrain and the point of fall of the bomb. The Nagasaki Prefectural Report describes vividly the impress of the bomb on the city and its inhabitants:

"Within a radius of one kilometer from ground zero, men and animals died almost instantaneously from the tremendous blast pressure and heat; houses and other structures were smashed, crushed and scattered; and fires broke out. The strong complex steel members of the structures of

the Mitsubishi Steel Works were bent and twisted like jelly and the roofs of the reinforced concrete National Schools were crumpled and collapsed, indicating a force beyond imagination. Trees of all sizes lost their branches or were uprooted or broken off at the trunk.

"Outside a radius of one kilometer and within a radius of two kilometers from ground zero, some men and animals died instantly from the great blast and heat, but the great majority were seriously or superficially injured. Houses and other structures were completely destroyed while fires broke out everywhere. Trees were uprooted and withered by the heat.

"Outside a radius of two kilometers and within a radius of four kilometers from ground zero men and animals suffered various degrees of injury from window glass and other fragments scattered about by the blast and many were burned by the intense heat. Dwelling and other structures were half damaged by blast.

"Outside a radius of four kilometers and within a radius of eight kilometers from ground zero living creatures were injured by materials blown about by the blast; the majority were only superficially wounded. Houses were half or only partially damaged."

While the conflagration with its uniformly burnt out area caught the attention at Hiroshima, the blast effects, with their resemblance to the aftermath of a hurricane, were most striking at Nagasaki. Concrete buildings had their sides facing the blast stove in like boxes. Long lines of steel framed factory sheds, over a mile from ground zero, leaned their skeletons away from the explosion. Blast resistant objects like telephone poles leaned away from the center of the explosion; on the surrounding hills trees were blown down within considerable areas. Although there was no general conflagration, fires contributed to the total damage in nearly all concrete structures. Evidence of primary fire is more frequent than at Hiroshima.

Because parts of the city were protected by hills, more than one-half of the residential units escaped serious damage. Of the 52,000 residential units in the city on 1 August, 14,146 or 27.2 percent were completely destroyed (by Japanese count) (11,494 of these were burned); 5,441 or 10.5 percent were half-burned or destroyed; many of the remaining units suffered superficial or minor damage. In 558 non-residential buildings in the built-up area of Nagasaki which the Survey studied, almost 60 percent of the usable floor area was destroyed or structurally damaged. Only 12 percent was undamaged, the rest suffering superficial or minor damage.

The survival of a higher percentage of the buildings, then, distinguishes Nagasaki from Hiroshima; so also, on the other hand, does the damage to factories. In Nagasaki, only the Mitsubishi Dockyards among the major industries was remote enough from the explosion to

escape serious damage. The other three Mitsubishi firms, which were responsible together with the dockyards for over 90 percent of the industrial output of the city, were seriously damaged. The Arms Plant and the Steel Works were in the main area of damage. Plant officials estimated that 58 percent of the value of the former and 78 percent of the value of the latter were destroyed: Survey investigators considered the two plants to be 50 percent destroyed. The Mitsubishi Electric Works were on the edge of the main area of destruction, but suffered 10 percent structural damage.

One or two paragraphs from the report of the commanding officer of Sasebo Naval District will illustrate the sort of damage done to industrial installations. Of two plants of the Mitsubishi Arms Works, he reports:

"With the exception of the tunnel workshops and the half-underground workshops, the Ohashi and Mori Machi Plants were completely destroyed by collapse. Reinforced concrete structures in these plants were severely damaged internally - ceilings collapsed, fittings of all sorts were destroyed, and equipment was damaged. Casting and forging shops in the Ohashi Plant were destroyed by fire, which broke out in those structures. The Mori Machi Plant was nearly completely destroyed by fire. Taking both plants together, 60% of the machinery installations was damaged. In the Ohashi Plant, from 80 to 90% of the machinery can be used again; in the Mori Machi Plant only 40 to 50% of the machinery can be used in the future."

Or of the Mitsubishi Steel Works:

"Plant structures here (some north-light steel framed structures) suffered extensive damage to roofs and walls as steel plates were blown off. The frames themselves were bent, twisted, or toppled over, and several buildings caught fire. Hardly any of the machinery in the plant can be used again in its present condition. However, nearly 70% of the machinery can be repaired."

In general, (as has proved true with high explosive or incendiary bombs also), the damage to machinery and other contents of a factory was less than damage to the buildings. In addition, the air burst of the atomic bomb meant that it acted indirectly on machine tools and other building contents. Though a few tools were blown over by blast, almost all the serious damage was caused by debris from damaged buildings, overturning through mass movement of buildings, or burning of buildings.

Thus the extent and sort of damage to machinery depended on the construction of the buildings housing them. In wood frame buildings, 95 percent of the machines were seriously damaged, but in reinforced

concrete or steel framed buildings only one-third or one-fourth of the machines were affected seriously. As would be expected, fire caused much damage to machines in timber framed shops (practically all of which were destroyed up to 7,000 feet from ground zero) and some damage in other types of structure. Debris was a major cause of damage only in certain reinforced concrete buildings, where walls and roofs collapsed.

Shortage of raw materials had reduced operations at these four Mitsubishi plants to a fraction of their capacity. Had the raw material situation been normal and had the war continued, it is estimated that restoration of production would have been possible though slow. The dockyard, which was affected mainly by the 1 August attack rather than by the atomic bomb, would have been able to produce at 80 percent of full capacity within three or four months. The steel works would have required a year to get into substantial production, the electric works could have resumed production at a reduced rate within two months and been back at capacity within six months, and the arms plants would have required 15 months to reach two-thirds of their former capacity.

B. GENERAL EFFECTS

1. Casualties

The most striking result of the atomic bombs was the great number of casualties. The exact number of dead and injured will never be known because of the confusion after the explosions. Persons unaccounted for might have been burned beyond recognition in the falling buildings, disposed of in one of the mass cremations of the first week of recovery, or driven out of the city to die or recover without any record remaining. No sure count of even the pre-raid populations existed. Because of the decline in activity in the two port cities, the constant threat of incendiary raids, and the formal evacuation programs of the government, an unknown number of the inhabitants had either drifted away from the cities or been removed according to plan. In this uncertain situation, estimates of casualties have generally ranged between 100,000 and 180,000 for Hiroshima, and between 50,000 and 100,000 for Nagasaki. The Survey believes the dead at Hiroshima to have been between 70,000 and 80,000, with an equal number injured; at Nagasaki over 35,000 dead and somewhat more than that injured seem the most plausible estimate.

Most of the immediate casualties did not differ from those caused by incendiary or high explosive raids. The outstanding difference was the presence of radiation effects, which became unmistakable about a week after the bombing. At the time of impact, however, the causes of death and injury were flash burns, secondary effects of blast and falling debris, and burns from blazing buildings. No records are available that give the relative importance of the various types of injury, especially for those who died immediately after the explosion. Indeed, many of these people undoubtedly died several times over, theoretically, since each was subjected to several injuries any one of which would have been fatal. The Hiroshima prefectural health department placed the proportion of deaths from burns (flash or flame) at 60 percent, from falling debris at 30 percent and from other injuries at 10 percent; it is generally agreed that burns caused at least 50 percent of the initial casualties. Of those who died later, an increasing proportion succumbed to radiation effects.

The seriousness of these radiation effects may be measured by the fact that 95 percent of the traced survivors of the immediate explosion who were within 3,000 feet suffered from radiation disease. Colonel Stafford Warren, in his testimony before the Senate Committee on Atomic Energy, estimated that radiation was responsible for 7 to 8 percent of the total deaths in the two cities. Most medical investigators who spent some time in the areas feel that this estimate is far too low; it is generally felt that no less than 15 to 20 percent of the deaths were from radiation. In addition, there were an equal number who were casualties but survived, as well as uncounted thousands who probably were affected by the gamma rays but not enough to produce definite illness.

A plausible estimate of the importance of the various causes of death would range as follows:

Flash burns	20 to 30 per cent
Other injuries	50 to 60 per cent
Radiation Sickness	15 to 20 per cent

If we examine the nature of the casualties under each group of causes we find familiar and unfamiliar effects.

Flash burns.

The flash of the explosion, which was extremely brief, emitted radiant heat travelling at the speed of light. Flash burns thus followed the explosion instantaneously. The fact that relatively few victims suffered burns of the eyeballs should not be interpreted as an indication that the radiant heat followed the flash, or that time was required to build up to maximum heat intensity. The explanation is simply that the structure of the eye is more resistant to heat than is average human skin, and near ground zero the recessed position of the eyeball offered protection from the overhead explosion. Peak temperatures lasted only momentarily.

Survivors in the two cities stated that people who were in the open directly under the explosion of the bomb were so severely burned that the skin was charred dark brown or black and that they died within a few minutes or hours.

Among the survivors, the burned areas of the skin showed evidence of burns almost immediately after the explosion. At first there was marked redness, and other evidence of thermal burns appeared within the next few minutes or hours, depending on the degree of the burn. Uninfected burns healed promptly without any unusual clinical features, according to the Japanese physicians who attended the cases. American medical observers noted only a tendency to formation of excess scar tissue, which could be satisfactorily explained as the result of malnutrition and the large degree of secondary infection that complicated healing of the burns. There were also a few instances of burns healing with contractures and limitation of the mobility of certain joints, such as the elbows or knees. In many instances, these primary burns of minor nature were completely healed before patients developed evidence of radiation effects.

Because of the brief duration of the flash wave and the shielding effects of almost any objects -- leaves and clothing as well as buildings -- there were many interesting cases of protection. The radiant heat came in a direct line like light, so that the area burned corresponded to this directed exposure. Persons whose sides were toward the explosion often showed definite burns of both sides of the back while the hollow of the back escaped. People in buildings or houses were apparently burned only if directly exposed through the windows. The most striking instance was that of a man writing before a window. His hands were seriously burned but his exposed face and neck suffered only slight burns due to the angle of entry of the radiant heat through the window.

Flash burns were largely confined to exposed areas of the body, but on occasion would occur through varying thicknesses of clothing. Generally speaking, the thicker the clothing the more likely it was to give complete protection against flash burns. One woman was burned over the shoulder except for a T-shaped area about one-fourth inch in breadth; the T-shaped area corresponded to an increased thickness of the clothing from the seam of the garment. Other people were burned through a single thickness of kimono but were unscathed or only lightly affected underneath the lapel. In other instances, skin was burned beneath tightly fitting clothing but was unburned beneath loosely fitting portions. Finally, white or light colors reflected heat and afforded some protection; people wearing black or dark-colored clothing were more likely to be burned.

Other Injuries

Because of the combination of factors at the area near the center of the explosion, the casualty effects of blast are hard to single out. If it is remembered that even directly under the explosion people were several hundred feet away from the air-burst, it will be easier to understand why true blast effects were relatively rare. Only toward the periphery of the affected zone was the blast effect lateral and likely to throw people violently against buildings, and at the periphery the intensity of the blast had fallen off sharply. Comparatively few instances were reported of arms or legs being torn from the body by flying debris. Another indication of the rarity of over-pressure is the scarcity of ruptured eardrums. Among 106 victims examined by the Japanese in Hiroshima on 11 and 12 August, only three showed ruptured eardrums; a study done in October at the Omura hospital near Nagasaki revealed that only two of 92 cases had ruptured eardrums. Only at Nagasaki were there reports of over-pressure in the stock wave. Some of the dead were said by survivors to have had their abdomens ruptured and intestines protruding; others were reported to have protruding eyes and tongues, and to have looked as if they had drowned. Thorough check by Allied investigators discredited these stories as evidence of direct blast effects; the normal effects of blast are internal hemorrhage and crushing. These external signs point to injuries from debris rather than blast.

Injuries produced by falling and flying debris were much more numerous, and naturally increased in number and seriousness nearer the center of the affected area. The collapse of the buildings was sudden, so that thousands of people were pinned beneath the debris. Many were able to extricate themselves or received aid in escaping, but large numbers succumbed either to their injuries or to fire before they could be extricated. The flimsiness of Japanese residential construction should not be allowed to obscure the dangers of collapse; though the walls and partitions were light, the houses had heavy roof timbers and heavy roof tiles. Flying glass from panels also caused a large number of casualties, even up to 15,000 feet from ground zero.

The number of burns from secondary fires was slight among survivors, but it was probable that a large number of the deaths in both cities came

from the burning of people caught in buildings. Eyewitness accounts agree that many fatalities occurred in this way, either immediately or as a result of the lack of care for those who did extricate themselves with serious burns. There are no references, however, to people in the streets succumbing either to heat or to carbon monoxide as they did in Tokyo or in Hamburg, Germany. A few burns resulted from clothing set afire by the flash wave, but in most cases people were able to beat out such fires without serious injury to the skin.

Radiation Disease

The radiation effects upon survivors resulted from the gamma rays liberated by the fission process rather than from induced radio-activity or the lingering radio-activity of deposits of primary fission products. Both at Nagasaki and at Hiroshima, pockets of radio-activity have been detected where fission products were directly deposited, but the degree of activity in these areas was insufficient to produce casualties. Similarly, induced radio-activity from the interaction of neutrons with matter caused no authenticated fatalities. But the effects of gamma rays -- here used in a general sense to include all penetrating high-frequency radiations and neutrons that caused injury -- are well established, even though the Allies had no observers in the affected areas for several weeks after the explosions.

Our understanding of radiation casualties is not complete. In part the deficiency is in our basic knowledge of how radiation affects animal tissue. In the words of Dr. Robert Stone of the Manhattan Project, "The fundamental mechanism of the action of radiation on living tissues has not been understood. All methods of treatment have therefore been symptomatic rather than specific. For this reason, studies into the fundamental nature of the action of radiation have been carried on to some extent, the limitation being that it was unlikely that significant results could be obtained during the period of war."

According to the Japanese, those individuals very near the center of the explosion but not affected by flash burns or secondary injuries became ill within two or three days. Bloody diarrhea followed, and the victims expired, some within two to three days after the onset and the majority within a week. Autopsies showed remarkable changes in the blood picture -- almost complete absence of white blood cells, and deterioration of bone marrow. Mucous membranes of the throat, lungs, stomach, and intestines showed acute inflammation.

The majority of the radiation cases, who were at greater distances, did not show severe symptoms until one to four weeks after the explosion, though many felt weak and listless on the following day. After a day or two of mild nausea and vomiting, the appetite improved and the person felt quite well until symptoms reappeared at a later date. In the opinion of some Japanese physicians, those who rested or subjected themselves to less physical exertion showed a longer delay before the onset of subsequent symptoms. The first signs of recurrence were loss of appetite, lassitude,

and general discomfort. Inflammation of the gums, mouth, and pharynx appeared next. Within 12 to 48 hours, fever became evident. In many instances it reached only 100° Fahrenheit and remained for only a few days. In other cases, the temperature went as high as 104° or 106° Fahrenheit. The degree of fever apparently had a direct relation to the degree of exposure to radiation. Once developed, the fever was usually well sustained, and in those cases terminating fatally it continued high until the end. If the fever subsided, the patient usually showed a rapid disappearance of other symptoms and soon regained his feeling of good health. The other symptoms commonly seen were shortage of white corpuscles, loss of hair, inflammation and gangrene of the gums, inflammation of the mouth and pharynx, ulceration of the lower gastrointestinal tract, small livid spots (petechiae) resulting from escape of blood into the tissues of the skin or mucous membrane, and larger hemorrhages of gums, nose and skin.

Loss of hair usually began about two weeks after the bomb explosion, though in a few instances it is reported to have begun as early as four to five days afterwards. The areas were involved in the following order, with variations depending on the degree of exposure: scalp, armpits, beard, pubic region, and eyebrows. Complete baldness was rare. Microscopic study of the body areas involved has shown atrophy of the hair follicles. In those patients who survived after two months, however, the hair has commenced to regrow. An interesting but unconfirmed report has it that loss of the hair was less marked in persons with grey hair than in those with dark hair.

A decrease in the number of white blood corpuscles in the circulating blood appears to have been a constant accompaniment of radiation disease, even existing in some milder cases without other radiation effects. The degree of leukopenia was probably the most accurate index of the amount of radiation a person received. The normal white blood count averages 5,000 to 7,000; leukopenia is indicated by a count of 4,000 or less. The white blood count in the more severe cases ranged from 1,500 to 0, with almost entire disappearance of the bone marrow. The moderately severe cases showed evidence of degeneration of bone marrow and total white blood counts of 1,500 to 3,000. The milder cases showed white blood counts of 3,000 to 4,000 with more minor degeneration changes in the bone marrow. The changes in the system for forming red blood corpuscles developed later, but were equally severe.

Radiation clearly affected reproduction, though the extent has not been determined. Sterility has been a common finding throughout Japan, especially under the conditions of the last two years, but there are signs of an increase in the Hiroshima and Nagasaki areas to be attributed to the radiation. Sperm counts done in Hiroshima under American supervision revealed low sperm counts or complete aspermia for as long as three months afterwards in males who were within 5,000 feet of the center of the explosion. Cases dying of radiation disease showed clear affects on spermatogenesis. Study of sections of ovaries from autopsied radiation victims has not yet been completed. The effects of the bomb on pregnant women are marked, however. Of women in various stages of pregnancy who were

within 3,000 feet of ground zero, all known cases have had miscarriages. Even up to 6,500 feet they have had miscarriages or premature infants who died shortly after birth. In the group between 6,500 feet and 10,000 feet, about one-third have given birth to apparently normal children. Two months after the explosion, the city's total incidence of miscarriages, abortions, and premature births was 27 per cent as compared with a normal rate of 6 per cent. Since other factors than radiation contributed to this increased rate, a period of years will be required to learn the ultimate effects of mass radiation upon reproduction.

Treatment of victims by the Japanese was limited by the lack of medical supplies and facilities. Their therapy consisted of small amounts of vitamins, liver extract, and an occasional blood transfusion. Allied doctors used penicillin and plasma with beneficial effects. Liver extract seemed to benefit the few patients on whom it was used: it was given in small frequent doses when available. A large percentage of the cases died of secondary disease, such as septic bronchopneumonia or tuberculosis, as a result of lowered resistance. Deaths from radiation began about a week after exposure and reached a peak in three to four weeks. They had practically ceased to occur after seven to eight weeks.

Unfortunately, no exact definition of the killing power of radiation can yet be given, nor a satisfactory account of the sort and thickness of concrete or earth that will shield people. From the definitive report of the Joint Commission will come more nearly accurate statements on these matters. In the meanwhile the awesome lethal effects of the atomic bomb and the insidious additional peril of the gamma rays speak for themselves.

There is reason to believe that if the effects of blast and fire had been entirely absent from the bombing, the number of deaths among people within a radius of one-half mile from ground zero would have been almost as great as the actual figures and the deaths among those within one mile would have been only slightly less. The principal difference would have been in the time of the deaths. Instead of being killed outright as were most of these victims, they would have survived for a few days or even three or four weeks, only to die eventually of radiation disease.

These suppositions have vital importance, for actually in Nagasaki and Hiroshima many people who were protected by structures against blast and fire were not protected against the effect of gamma rays. The complexity of the problem of shelter protection has been increased by this necessity of shielding against radiant heat and gamma rays. Fortunately, earth and concrete will shield against gamma rays, the required thickness varying with the intensity of the rays.

The slow and inadequate treatment of victims by the Japanese probably contributed to the high casualty rates. Many persons could undoubtedly have been saved had facilities, supplies and personnel been available immediately after the bombings. Probably the number of deaths from the true blast effects, flame burns, or serious injuries from collapsing structures would not have been altered appreciably; generally speaking, these cases either were killed outright or else survived. Many of the flash burn cases could have been saved with tremendous quantities of plasma and parenteral fluids if treatment could have begun within a few hours after the bombing. Probably the most significant results could have been achieved with the radiation cases. With large quantities of whole blood and adequate supportive treatment, possibly 10 to 20 percent of those dying of radiation might have survived. However, it is doubtful that 10 percent of all the deaths resulting from the atomic bombs could have been avoided with the best medical care. A more likely figure is 5 to 8 percent.

B F

2. Morale*

As might be expected, the primary reaction to the bomb was fear -- uncontrolled terror, strengthened by the sheer horror of the destruction and suffering witnessed and experienced by the survivors. Between one-half and two-thirds of those interviewed in the Hiroshima and Nagasaki areas confessed having such reactions, not just for the moment but for some time. As two survivors put it:

"Whenever a plane was seen after that, people would rush into their shelters: they went in and out so much that they did not have time to eat. They were so nervous they could not work."

"After the atomic bomb fell, I just couldn't stay home. I would cook, but while cooking I would always be watching out and worrying whether an atomic bomb would fall near me."

The behavior of the living immediately after the bombings, as described earlier, clearly shows the state of shock that hindered rescue efforts. A Nagasaki survivor illustrates succinctly the mood of survivors:

"All I saw was a flash and I felt my body get warm and then I saw everything flying around. My grandmother was hit on the head by a flying piece of roof and she was bleeding . . . I became hysterical seeing my grandmother bleeding and we just ran around without knowing what to do."

"I was working at the office. I was talking to a friend at the window. I saw the whole city in a red flame, then I ducked. The pieces of the glass hit my back and face. My dress was torn off by the glass. Then I got up and ran to the mountain where the good shelter was."

The two typical impulses were those: aimless, even hysterical activity, or flight from the city to shelter and food.

The accentuated effect of these bombs came not only from the surprise and their crushing power, but also from the feeling of security among the inhabitants of the two cities before the attacks. Though Nagasaki had undergone five raids in the previous year, they had not been heavy, and Hiroshima had gone almost untouched until the morning of 6 August 1945. In both cities many people felt that they would be spared, and the various rumors in circulation supporting such feeling covered a wide range of wishful thoughts. There were so many Christians

* A U.S.S.B.S. Morale division team interviewed a scientifically selected sample of almost 250 persons: 128 from Hiroshima and Nagasaki cities, and 120 from the immediately surrounding areas. The same standard questions were put to these people and similar groups in representative Japanese cities.

there, many Japanese-Americans came from Hiroshima, the city was a famous beauty spot --these and other even more fantastic reasons encouraged hopes. Other people felt vaguely that their city was being saved for "something big", however.

Such a shattering event could not fail to have its impact on people's ways of thinking. Study of the patterns of belief about the war, before and after the bombing, show this change clearly. Prior to the dropping of the atomic bombs, the people of the two target cities appear to have had fewer misgivings about the war than people in other cities. Responses to set questions indicate that among Japanese civilians prior to 1 July 1945

59% in the Hiroshima-Nagasaki areas

but

74% in the other urban areas

entertained doubts about a Japanese Victory;

31% in Hiroshima-Nagasaki

but

47% in other urban areas

felt certain that victory for Japan was impossible;

12% in Hiroshima-Nagasaki

but

34% in other urban areas

had reached a point where they felt unable to continue the war.

Further,

28% of the people of Japan as a whole said they had never reached a point where they felt they could not go on with the war whereas

39% of the people in the Hiroshima-Nagasaki areas said they had never reached such a point.

These figures clearly suggest that the will to resist had indeed been higher in the "atomic bomb cities" than in Japan as a whole.

There is no doubt that the bomb was the most important influence among the people of these areas in making them think that defeat was inevitable. An additional twenty-eight percent stated that after the atomic bomb was dropped they became convinced that victory for Japan was impossible. Almost one-fourth admitted that because of the bombing they felt personally unable to carry on. Forty percent testified to various degrees of defeatism induced by the atomic bomb. Significantly, certainty of defeat was much more prevalent at Hiroshima, where the area of devastation and the casualties were greater, than at Nagasaki.

Typical comments of survivors were:

"If the enemy has this type of bomb, everyone is going to die, and we wish the war would hurry and finish."

"I did not expect that it was that powerful. I thought we have no defense against such a bomb."

"One of my children was killed by it, and I didn't care what happened after that."

Other reactions were found. In view of their experiences, it is not remarkable that some of the survivors (nearly one-fifth) hated the Americans for using the bomb or expressed their anger in such terms as "cruel", "inhuman", and "barbarous".

". . . they really despise the Americans for it, the people all say that if there are such things as ghosts, why don't they haunt the Americans?"

"When I saw the injured and killed, I felt bitter against the enemy."

"After the atomic bomb exploded, I felt that now I must go to work in a munitions plant. . . My sons told me that they wouldn't forget the atomic bomb even when they grow up."

The reaction of hate and anger is not surprising, and it is likely that in fact it was a more extensive sentiment than the figures indicate, since unquestionably many respondents, out of fear or politeness, did not reveal their sentiments with complete candor. Despite this factor, the frequency of hostile sentiments seems low. Two per cent of the respondents even volunteered the observation that they did not blame the U.S. for using the bomb. There is evidence that some hostility was turned against their own government, either before or after the surrender, although only a few said they wondered why their nation could not have made the bomb. In many instances the reaction was simply one of resignation. A common comment was, "Since it was war, it was just Shikata-ga-nai (Too bad)."

Admiration for the bomb was more frequently expressed than anger. Over one-fourth of the people in the target cities and surrounding areas said they were impressed by its power and by the scientific skill which underlay its discovery and production.

Of greater significance are the reaction of the Japanese people as a whole. The two raids were all-Japan events and were intended so: the Allied powers were trying to break the fighting spirit of the Japanese people and their leaders, not just of the residents of Hiroshima and Nagasaki. Virtually all the Japanese people had a chance to react to the bomb, though the news had not reached to full spread at the time of the surrender. By the time the interviewing was done, only about two per cent of the population in rural areas and one per cent in the cities had not heard of the bomb.

The reactions found in the bombed cities appeared in the country as a whole -- fear and terror, anger and hatred against the users, admiration for the scientific achievement -- though in each case with less intensity. The effect of the bomb on attitudes toward the war in Japan as a whole was, however, much less marked than in the target cities. While 40% of the latter respondents reported defeatist feelings induced by the bomb, 28% of those in the islands as a whole attributed such reactions to the news of the bomb. There are at least three possible explanations of this difference. First, the level of confidence was quite low in Japan well before the time of the atomic bombing. Prior to 1 July 1945 doubts about a Japanese victory were felt by 74 per cent of the population. By the same date 47 per cent had become certain that a Japanese victory was impossible, and 34 per cent felt that they could not go on with the war. Under these circumstances, the announcement of a new and devastating weapon was merely an addition to the already eloquent evidence of national weakness. Second, the reaction of those at some distance from the target cities seems to have been blunted by their direct experience with other sorts of misfortunes and hardships, the common phenomenon of psychological distance increasing with geographical distance. In Japan as a whole, for example, military losses and failures, such as those at Saipan, the Philippines, and Okinawa, were twice as important as this atomic bomb in inducing certainty of defeat. Other raids over Japan as a whole were more than three times as important in this respect. Consumer deprivations, such as food shortages and the attendant malnutrition, were also more important in bringing people to the point where they felt they could not go on with the war.

Third, the lack of understanding of the meaning of the new weapon in areas away from the target undoubtedly limited its demoralizing effect. As distance from the target cities increased, the effectiveness of the bombs in causing certainty of defeat declined progressively:

Group of Cities	% of Population certain of defeat because of Atomic Bomb
Hiroshima - Nagasaki	25%
Cities nearest to target cities.	23%
Cities near to target cities.	15%
Cities far from target cities.	8%
Cities farthest from target cities.	6%

Only in the nearest group of cities, within forty miles of Hiroshima or Nagasaki, was there a substantial effect on morale. Were the channels of mass communication as readily available to all the population as they are in the U.S. and had the use of the bomb received anything like the intensive coverage it had here, the effect on continued support of the war would probably have been greater. Something approaching such knowledge, of course, probably would have spread rather widely had

the war continued many more weeks, whether sanctioned by the censors or spread by the ever-active rumor channels so common in the country.

It is apparent that the effect of the atomic bombings on the confidence of the Japanese civilian population was remarkably localized. Outside of the target cities, it was subordinate to other demoralizing experiences. The effect which it did have was probably due largely to the number of casualties and the nature of the injuries received. These consequences were in part the result of surprise and the vulnerability of the raid defense system. Properly enforced warnings, precautions, and an emergency care organization of the scale of the bomb's effects might have reduced casualties and, therefore, the effects on morale.

Even in the target cities, it must be emphasized, the atomic bombs did not uniformly destroy the Japanese fighting spirit. Hiroshima and Nagasaki, when compared with other Japanese cities, were not more defeatist than the average. The bombs were tremendous personal catastrophes to the survivors, but neither time nor understanding of the revolutionary threat of the atomic bomb permitted them to see in these personal catastrophes a final blow to Japan's prospects for victory or negotiated peace.

3. The Japanese Decision to Surrender.

The further question of the effects of the bombs on the morale of the Japanese leaders and their decision to abandon the war is tied up with other factors. The atomic bomb had more effect on the thinking of government leaders than on the morale of the rank and file of civilians outside of the target areas. It cannot be said, however, that the atomic bomb convinced the leaders who effected the peace of the necessity of surrender. The decision to surrender, influenced in part by knowledge of the low state of popular morale, had been taken at least as early as 26 June at a meeting of the Supreme War Guidance Council in the presence of the Emperor.

This decision did not, of course, represent the unanimous feeling of those influential in government circles. As early as the spring of 1944 a group of former prime ministers and others close to the Emperor had been making efforts toward bringing the war to an end. This group, including such men as Admiral Okada, Admiral Yonai, Prince Konoye, and Marquis Kido, had been influential in effecting Tojo's resignation and in making Admiral Suzuki Prime Minister after Koiso's fall. Even in the Suzuki cabinet, however, agreement was far from unanimous. The Navy Minister, Admiral Yonai, was sympathetic, but the War Minister, General Anami, usually represented the fight-to-the-end policy of the Army. In the Supreme War Guidance Council, a sort of inner cabinet, his adherence to that line was further assured by the participation of the Army and Navy Chiefs of Staff, so that on the peace issue this organization was evenly divided, with these three opposing the Prime

Minister, Foreign Minister, and Navy Minister. At any time military (especially Army) dissatisfaction with the Cabinet might have eventuated at least in its fall and possibly in the "liquidation" of the anti-war members.

Thus the problem facing the peace leaders in the government was to bring about a surrender despite the hesitation of the War Minister and the opposition of the Army and Navy Chiefs of Staff. This had to be done, moreover, without precipitating counter measures by the Army which would eliminate the entire peace group. This was done ultimately by bringing the Emperor actively into the decision to accept the Potsdam terms. So long as the Emperor openly supported such a policy and could be presented to the country as doing so, the military, which had fostered and lived on the idea of complete obedience to the Emperor, could not effectively rebel.

A preliminary step in this direction had been taken at the Imperial Conference on 26 June. At this meeting, the Emperor, taking an active part despite his custom to the contrary, stated that he desired the development of a plan to end the war as well as one to defend the home islands. This was followed by a renewal of earlier efforts to get the Soviet Union to intercede with the United States, which were effectively answered by the Potsdam Declaration on 25 July and the Russian declaration of war on 9 August.

The atomic bombings considerably speeded up these political maneuverings within the government. This in itself was partly a morale effect, since there is ample evidence that members of the Cabinet were worried by the prospect of further atomic bombings, especially on the remains of Tokyo. The bombs did not convince the military that defense of the home islands was impossible, if their behavior in government councils is adequate testimony. It did permit the Government to say, however, that no army without the weapon could possibly resist an enemy who had it, thus saving "face" for the Army leaders and not reflecting on the competence of Japanese industrialists or the valor of the Japanese soldier. In the Supreme War Guidance Council voting remained divided, with the War Minister and the two Chiefs of Staff unwilling to accept unconditional surrender. There seem little doubt, however, that the bombing of Hiroshima and Nagasaki weakened their inclination to oppose the peace group.

The peace effort culminated in an Imperial conference held on the night of 9 August and continued into the early hours of 10 August, for which the stage was set by the atomic bomb and the Russian war declaration. At this meeting the Emperor, again breaking his customary silence, stated specifically that he wanted acceptance of the Potsdam terms.

A quip was current in high government circles at this time that the atomic bomb was the real Kamikaze, since it saved Japan from

further useless slaughter and destruction. It is apparent that in the atomic bomb the Japanese found the opportunity which they had been seeking, to break the existing deadlock within the government over acceptance of the Potsdam terms.

III. HOW THE ATOMIC BOMB WORKS

Out of the stories of Hiroshima and Nagasaki can be built up, detail by detail, the picture of how the atomic bomb works: the different forms of energy given off, the velocity and intensity of each, the sort of effects each has on animate and inanimate objects. In these factors is the real story of what happened at Hiroshima and Nagasaki, for in them chance circumstances are ruled out.

Spectators' accounts, whether of the New Mexico, the Hiroshima, or the Nagasaki explosion, describe similar pictures. At Nagasaki, for example, the bomb exploded at 1102 with a tremendous flash of blue-white light, like a giant magnesium flare. The flash was accompanied by a rush of heat and was followed by a huge pressure wave and the rumbling sound of the explosion. Curiously enough, this sound was not distinctly noted by those who survived near the center of the explosion, although it was heard as far as 15 miles away. People on the hillsides in the country at a considerable distance from Nagasaki told of seeing the blue-white and then multi-colored flash over the city, followed some seconds later by a tremendous clap, like thunder very close overhead. A huge snow-white cloud shot rapidly into the sky and the scene on the ground was obscured first by a bluish haze and then by a purple-brown cloud of dust and smoke.

The survivors were not aware at the time that a radically new bomb had been used. They were conscious of an explosion of tremendous power, but even the government had no conception, until President Truman's announcement was broadcast, of the new principle of operation. If we strip our minds of any lingering prejudice that the atomic bomb is supernatural or incomprehensible in its operation, we shall see why its uniqueness was not at first recognized.

1. The Nature of the Explosion

The atomic bomb works by explosion. An explosion is, in the words of the Smyth report, simply a "sudden and violent release of a large amount of energy in a small region." As do ordinary high explosives, atomic bombs release energy, though on an unprecedented scale. The energy takes three forms (one of which is new), and all the effects of the bomb can be referred directly to these three kinds of energy. They are:

- (1) Heat (which is present in other explosions, as the familiar injuries known as "flash burns" on warships illustrate, but ordinarily not at high enough diffused temperatures to burn a man or set fire to combustible objects at any considerable distance from the explosion.)
- (2) Radiation (similar to x-rays or to that from radium.)
- (3) Blast or pressure (as from a demolition bomb.)

The whole discussion of the effects of the atomic bomb will be phrased in terms of these three kinds of energy. No other more mysterious or immeasurable forces acted; these were all.

These were enough. The energy released in atomic explosion is of such magnitude and from so concentrated a source that it sets entirely new problems in its use or in protection against it. Ordinary burning or explosion is a chemical reaction in which energy is released during the rearrangement of the atoms of the explosive material. In an atomic reaction, however, the identity of the atoms, not simply their arrangement, is changed. The change is more fundamental: in it, matter is transformed into energy. The energy released when a pound of nitroglycerine explodes, would, when converted into heat, raise the temperature of 150 pounds of water by 18° Fahrenheit. The explosion of a pound of uranium would produce an equal temperature rise in 2 billion pounds of water. Clearly, only a small part of the mass in the bomb's active core need be transformed to give an explosion of tremendous power.

At the time of the explosion, then, energy was given off in the forms of light, heat, gamma radiation, and pressure. The whole range of radiations, indeed, seems to have been present. There were heat radiations in the low frequency band below infra-red, visible waves of all colors (as the eyewitness accounts show), and penetrating radiations of very high frequency generally grouped as "gamma rays". Light and radiant heat ("flash heat") sped out in all directions at a rate of 186,000 miles per second, and the gamma rays at the same rate (though their effect was not immediately obvious.) The shock waves travelled much more slowly: it may be inferred from tests with high explosives that the rate at a relative short distance from the point of explosion was about two miles per second, and dropped rapidly to the speed of sound, or about one fifth of a mile per second. Thus the light, heat, and gamma radiation reached the target first, followed by shock and sound and the high winds of the blast.

(2) Heat

The center of the explosions--several hundred feet above ground--was a ball of fire. Because the radiant heat given off at the explosion easily charred combustible objects while ceasing so quickly that surfaces not in the direct line of radiation were unaffected, there are clearly marked "shadows" visible where objects were shielded against the heat. By projecting back the sharply defined outlines of these shadows, Japanese and Allied scientists have determined the height and diameter of the fireball. The two fireballs were apparently several hundred feet in diameter. The temperature at their core was virtually inconceivable--millions of degrees Centigrade. Even at its edge, the temperature was several thousand degrees; reasoning from the heat effects observed on human beings, bubbled roof tile,

and combustible materials, Japanese and Allied scientists have placed the figure variously between 3000 and 9000° Centigrade. Energy given off in heat alone was estimated by Japanese physicists at the astronomical figure of 10^{13} calories.

The flash heat was intense enough to cause fires, despite the distance of the fire ball from the ground. Clothing ignited, though it could be quickly beaten out, telephone poles charred, thatched roofs of houses caught fire. In Hiroshima, the explosion started hundreds of fires almost simultaneously, the most distant of which was found 13,700 feet from ground zero; this, however, probably started when a building with a thatched roof collapsed onto a hot charcoal fire. Fires were started directly by flash heat in such easily ignitable substances as dark cloth, paper, or dry-rotted wood, within about 3,500 feet of ground zero; white-painted, concrete-faced or cement-stuccoed structures reflected the heat and did not ignite. A cedar bark roof and the top of a dry-rotted wooden platform 5200 feet west of ground zero, were reported to have been ignited by the bomb flash. The majority of initial fires in buildings, however, were started by secondary sources (kitchen charcoal fires, electric short-circuits, industrial process fires, etc.). In Nagasaki, both Japanese and American fire experts agreed that more fires were caused directly than indirectly, in a ratio of 60 to 40. The range of primary fire there is reported to have exceeded 10,000 feet.

Charred telephone poles were discernable for 10,000 feet south and 13,000 feet north of ground zero at Hiroshima, and for 13,000 feet or more at Nagasaki. Bubbling of roof tile occurred at Hiroshima from ground zero out to 4000 feet, though with only scattered frequency after 2000 feet. The same phenomenon was reported at Nagasaki, accompanied again by scarring and peeling of granitic rocks, almost a mile from ground zero. A similar bubbled surface was obtained at the National Bureau of Standards by heating a sample ~~sample~~ ^{sssp/} of the tile to 1800° Centigrade for a period of four seconds. The effect so produced extended deeper into the tile than did the bubbling caused by the atomic bomb, which indicates that the explosion of the bomb subjected the tile to a temperature of more than 1800° for less than four seconds.

Persons reported feeling heat on their skin as far away as 24,000 feet. Burns of unprotected skin certainly occurred up to 12/13,000 feet, and reportedly up to 15,000 feet--nearly three miles. Serious or third-degree burns were suffered by those directly exposed within 4,500 feet, and occasionally as remote as 7,200 feet. In the immediate area of ground zero, the heat charred corpses beyond recognition.

Clothing as well as buildings afforded considerable protection against the flash. Even a clump of grass or tree leaf was on occasion adequate.

The implication clearly is that the duration of the flash was less than the time required for the grass or leaf to shrivel. While an accurate estimate is not possible, the duration could hardly have exceeded a fraction of a second.

3. Radiation

From the chain reaction which produced the mass release of energy in the explosion, a wide range of radiations were released. The light and heat are familiar elements of explosions, but the free neutrons and high-frequency radiations such as gamma rays are a new phenomenon. These radiations are highly penetrating and lethal.

The damaging penetration of radiation would be possible from three sources:

- a.) From the high-frequency radiations, whether neutrons, gamma rays, or other unspecified rays, released in the chain reaction of the bomb.
- b.) From lingering radio-activity from deposits of primary fission products scattered in the explosion.
- c.) From induced radio-activity in the bombed area, caused by interaction of neutrons with matter penetrated.

Only the first cause seems to have had important effects, though there are detectable pockets of radio-activity in both cities. At Takasu, 10,000 feet from ground zero at Hiroshima, and at Nishiyama, 6,500 feet from ground zero in Nagasaki, scientific measurements weeks after the explosion showed radioactivity. Presumably this was from deposits of primary fission products rather than induced radio-activity. In tests of the ground and bones of victims of radiation disease, certain substances--phosphorus, barium, strontium, rare earths--have shown radio-activity. Though evidence of lingering radio-activity is slight, it is strong enough to leave open the ominous possibility of a different situation had the bomb exploded at ground level.

The radiation apparently had no lasting effects on the soil or vegetation: seeds later planted within a few hundred feet of ground zero grew normally. Examination of sub-surface soil in the immediate area showed presence of earthworms and other life only a few inches below the surface. The effect on human procreation is as yet undetermined, but pregnant women within a mile of ground zero showed an increased number of miscarriages, and there was in most cases a low sperm count among men in the same area. Stories of harmful effects on people who come into the area after the explosion have been disproved by investigation.

The rays proved lethal for an average radius of 3000 feet

from ground zero. They caused loss of hair up to 7500 feet and occasionally beyond, and other mild effects up to almost two miles.

4. Blast

The pressure or shock wave travelled out in all directions from the explosion. The blast effects produced were uniform, and essentially those of conventional large high-explosive weapons though on a much larger scale. Thus, instead of localized effects such as the collapse of a roof truss or wall panel, entire buildings were crushed or distorted as units.

The blast pressure, as with high explosives, rose almost instantaneously to a peak, declined more slowly, and then fell below atmospheric pressure for a period about three times the period during which it was above atmospheric pressure. The positive period--that during which the pressure was greater than atmospheric--was of much greater peak pressure than the succeeding, or negative phase. Short though the positive phase was--probably only slightly longer than a second--it lasted longer than the positive phase of ordinary bombs. Thus the effect of the atomic bomb on buildings was usually that of a powerful push which shoved buildings over or left them leaning, whereas high explosive bombs strike sharply and much more briefly and tend to punch holes in walls. The duration was also long enough so that almost all building failures came during the positive phase. Comparatively few evidences were found of failures of members during the longer but less intense negative phase; window shutters blown outwards toward the explosion were very rare.

Experiments with high explosives have shown that the face-on peak pressures are approximately two to five times as intense as side-on peak pressures; thus greater damage was inflicted on walls or roofs facing the blast than on similar surfaces parallel to the blast. Near ground zero, the blast struck almost vertically downward. Buildings were crushed if weak, or the roofs were crushed in with little or no damage to the walls. Trunks of trees remained standing, but stripped of their branches; telephone poles, pushed over farther out, also remained erect near the center. Many small buildings were virtually engulfed in the pressure wave and simultaneously crushed from different directions. At somewhat greater distances, both horizontal and vertical components of the blast were appreciable, and buildings suffered damage both to roofs and to walls facing the explosion. At considerable distances, where the blast was travelling in an almost horizontal direction, damage was predominantly inflicted on walls during the blast. In such cases, the buildings were often completely racked by the inability of roof truss members to transmit the pressure to the far walls.

Shielding was more important at Nagasaki than at Hiroshima, because of the hills that divided the city. Building restrictions in

Japan after the 1923 earthquake limited building heights to 100 feet; thus there was little shielding by buildings from these air-burst bombs.

Reflection and diffraction effects were observed. Had the blast travelled in completely straight lines, more buildings would have survived in Nagasaki than actually did. Reflection effects were most clearly observed in the destruction of parapet walls of roofs on the side away from the bomb, where reflection of the blast wave from the roof reinforced the blast impinging on the wall directly. They were also visible in the displacing and cracking of concrete decks of bridges within one thousand feet of ground zero, where reflection of the blast wave from the water struck the bridges where their resistance was least.

The resistance of buildings depended very largely on their construction, as two examples show.

a.) In the area between two and three thousand feet from ground zero at Nagasaki, only 9.5 per cent of the floor area of reinforced concrete buildings was destroyed or structurally damaged. Yet in the ring between 4,000 and 5,000 feet from ground zero, 56 per cent of such buildings was destroyed or structurally damaged. Careful examination showed that the difference lay solely in design, construction detail, and materials: the bomb detonated over a section containing the most carefully and strongly built buildings in the city, the majority multi-story earthquake resistant structures. This strength more than compensated for the greater intensity of blast. A rapidly diminishing blast was capable of serious damage to weaker buildings further away, mostly high single-story industrial buildings, with thin shell-type arch roofs.

b.) At both cities, steel framed buildings with corrugated asbestos walls and roofs suffered less structural damage than those with corrugated iron or sheet metal walls and roofs. The corrugated asbestos crumbled easily, permitting the blast pressure to equalize itself rapidly around the main framing members, but the steel siding transferred the pressure to the structural members, causing distortion or general collapse.

The limits of blast effects extended eight miles out, where some glass reportedly shattered in Hiroshima; at the same city, some roof stripping and disturbance of tiles was inflicted at the Japan Steel Company, 4.1 miles from ground zero.

In analyzing the extent of the destruction wrought by the bombs, it is necessary to discriminate between the two cities and between different types of buildings. Equivalent effects are found

at Nagasaki over greater areas. Structural damage to reinforced concrete buildings, both earthquake resistant and non-earthquake resistant, occurred within an area of 0.05 square miles at Hiroshima, but at Nagasaki similar severe damage was inflicted in an area of 0.43 square miles.

Severe damage to one-story light steel frame buildings was equally extensive at the two cities; the area was 3.3 square miles at Nagasaki and 3.4 square miles at Hiroshima. Heavy steel frame buildings could be studied only at Nagasaki, where they suffered structural damage over an area of 1.8 square miles.

One-story brick buildings with load bearing walls were severely damaged within an area of 8.1 square miles at Nagasaki, and within an area of 6.0 square miles at Hiroshima. Multi-story brick buildings, which were studied only at Hiroshima, were severely damaged within an area of 3.6 square miles.

Wood domestic buildings were severely damaged within an area of 7.5 square miles at Nagasaki, and within an area of 6.0 square miles at Hiroshima. Wood frame industrial and commercial buildings, which were of inferior construction, were severely damaged within 9.9 square miles at Nagasaki, and 8.5 square miles at Hiroshima.

Maximum blast pressures fall off very rapidly as the distance from the detonation increases. In the two bombed cities, thus, reinforced concrete buildings of good construction were structurally damaged only when within a few hundred feet of ground zero. Indeed, ground zero itself was too distant from air zero for the earthquake-resistant buildings to be collapsed. It is the opinion of the Survey's engineers that at Hiroshima more thorough destruction near ground zero, without significant loss in the scope of destruction, could have been achieved had the bomb been detonated at a lower altitude.

5. The Atomic Bomb Compared with Other Weapons.

In comparing the atomic bomb with other weapons, it is well to remember the importance of the height at which it exploded. Because of this distance from the targets, the atomic bombs did not exert at any point in Hiroshima or Nagasaki the high instantaneous peak pressures of even small high explosive bombs. For example, a single 100-pound bomb exploding at ground level exerts a higher blast pressure over an area of 1,000 square feet (for about 18 feet around its point of detonation) than did the atomic bomb at any point in either city.

That fact will place comparisons of the radii of effectiveness in the proper perspective. Even at the heights from which the atomic bomb was exploded in Japan, its blast effects were on a new scale because the duration of the blast was long compared to that of high explosive bombs. To take only one example: at Nagasaki brick buildings suffered structural damage within a radius averaging 6000 feet from ground zero. Comparable damage would be done by a 500-pound high explosive bomb burst at ground level for a radius of 55 feet; by a 1000-pound bomb for 80 feet; by a one-ton bomb for 110 feet; and by a two-ton bomb for 200 feet. A hypothetical ten-ton blockbuster (only ten-ton penetrating bombs have actually been used) could be expected to achieve equivalent damage over a radius of 400 feet. The area of effectiveness of the air-burst atomic bomb against brick buildings thus ranged from 15,000 times as great as that for a 500-pound bomb, to 225 times as great as that for the imaginary ten-ton blockbuster.

A simple table shows most strikingly the comparison between the striking forces needed for atomic and for conventional raids. Against the two atomic attacks can be set the data for the most effective single urban attack, that on Tokyo on 9 March 1945, and the average effort and results from the Twentieth Air Force's campaign against Japanese cities:

EFFORT AND RESULTS

	Hiroshima	Nagasaki	Tokyo	<u>Average of 93 Urban Attacks</u>
Planes	1	1	279	173
Bomb Load	1 atomic	1 atomic	1,667 tons	1,129 tons
Population Density per Square mile	46,000	65,000	130,000	unknown
Square miles destroyed	4.7	1.8	15.8	1.8
Killed and missing	70/80,000	35/40,000	83,600	1,850
Injured	70,000	40,000	102,000	1,830
Mortality rate per sq mile destroyed	15,000	20,000	5,300	1,000
Casualty rate per sq mile	32,000	43,000	11,800	2,000

What stands out from this compilation, even more than the extent of the destruction from a single concentrated source, is the unprecedented casualty rate from the combination of heat, blast, and gamma rays from the chain reaction.

On the basis of the known destructiveness of various bombs computed from the war in Europe and the Pacific and from tests, the Survey has estimated the striking force that would have been necessary to achieve the same destruction at Hiroshima and Nagasaki. To cause physical damage equivalent to that caused by the atomic bombs, approximately 1300 tons of bombs (one-fourth high explosives and three-fourths incendiaries) at Hiroshima and 600 tons (three-fourths high explosives and one-fourth incendiary) would have been required at Nagasaki--in the target area. To place that many bombs in the target area, assuming daylight attacks under essentially the same conditions of weather and enemy opposition that prevailed when the atomic bombs were dropped, it is estimated that 1600 tons of bombs would have had to be dropped at Hiroshima and 900 tons at Nagasaki. To these bomb loads would have had to be added a number of tons of anti-personnel fragmentation bombs to inflict comparable casualties: these would add about 500 tons at Hiroshima and 300 tons at Nagasaki. The total bomb loads would thus be 2100 tons at Hiroshima (400 HE, 1200 IB), and 1200 tons (675 HE, 225 IB) at Nagasaki. With each plane carrying ten tons, the attacking force required would have been 210 B-29s at Hiroshima and 120 B-29s at Nagasaki.

It should be kept in mind, however, that the area of damage at Nagasaki does not represent the full potential effectiveness of the atomic bomb used there. The damage was limited by the small size of the rather isolated section of the city over which the bomb exploded. Had the target been sufficiently large, with no sections protected by intervening hills, the area of damage would have been about five times as large. An equivalent bomb load which would correspond to the destructive power of the Nagasaki bomb rather than the imperfect results achieved would approximate 2200 tons of high explosives and incendiaries for physical damage plus 500 tons of fragmentation bombs for casualties, a total of 270 B-29 loads of ten tons each.

IV. SIGNPOSTS. The Danger, and What We Can Do About It.

A. The Danger.

The Survey's investigators, as they proceeded about their study, found an insistent question framing itself in their minds: "What if the target for the bomb had been an American city?" True, the primary mission of the Survey was to ascertain the facts just summarized. But conclusions as to the meaning of those facts, for citizens of the United States, forced themselves almost inescapably on the men who examined thoughtfully the remains of Hiroshima and Nagasaki. These conclusions have a different sort of validity from the measurable and ponderable facts of preceding sections, and therefore they are presented separately. They are not the least important part of this report, however, and they are stated with no less conviction.

No two cities, whether in Japan or the United States, are exactly alike. But the differences in terrain, layout and zoning, density, and type of construction can be allowed for one by one; when that is done, comparisons become possible. The most striking difference between American and Japanese cities is in residential districts: what happened to typical Japanese homes is not directly applicable to American residential districts. But in Japanese cities were many brick and wood frame buildings of Western or similar design and of good workmanship. It was the opinion of the Survey's engineers, with their professional familiarity with American buildings, that these Japanese buildings reacted to the bomb much as typical American buildings would have. And these buildings were exceedingly vulnerable: multi-story brick buildings with load-bearing walls were destroyed or seriously damaged over an area of 3.6 square miles at Hiroshima, while similar one-story brick buildings were destroyed or seriously damaged within an area of six square miles. Wood frame buildings built as industrial or commercial shops suffered similar damage in an area of over eight miles, while Japanese residences were destroyed or seriously damaged within an area of six square miles. This was at Hiroshima, where the less powerful bomb was used!

These figures indicate what would happen to typical wood, brick, and stucco structures in American cities. Modern reinforced concrete and steel frame buildings would fare better here -- as they did in Japan. But the following table shows how American cities are built, and how few are of blast-resistant construction.

CITY	TOTAL STRUCTURES	TYPES OF STRUCTURES BY EXTERIOR MATERIAL (U.S. CITIES)				
		WOOD	BRICK	STUCCO	OTHER NUMBER	%
New York	591,319	236,879	299,482	41,661	13,297	2.2%
Washington	156,359	48,971	95,939	5,764	5,685	3.5%
Chicago	382,628	131,148	238,959	5,797	6,724	1.7%
Detroit	267,677	165,488	94,333	1,923	5,933	2.2%
San Francisco	105,180	61,172	2,334	40,902	722	0.7%

SOURCE: 16th Census of U.S. (1940) Vol. II.

The overwhelming bulk of the buildings in American cities could not stand up against an atomic bomb bursting a mile or a mile and a half from them.

And the people? We must not too readily discount the casualty rate because of the teeming populations of congested Japanese cities. American cities too have their crowded slums, and in addition tend to build vertically so that the density of the population is high in a given area even though each apartment dweller may have more living space than his Japanese equivalent.

POPULATION DENSITIES
U.S. AND JAPANESE CITIES

CITY	POPULATION	AREA SQ. MI.	POPULATION DENSITY PER SQ. MILE
New York	7,492,000	322.8	23,200
Manhattan (day)	3,200,000	22.2	145,000
Manhattan (night)	1,689,000	22.2	76,000
Bronx	1,493,700	41.4	34,000
Brooklyn	2,792,600	80.9	34,200
Queens	1,340,500	121.1	11,000
Staten Island	176,200	57.2	3,000
Washington	663,091	61.4	11,000
Chicago	3,396,808	206.7	16,500
Detroit	1,623,452	137.9	11,750
San Francisco	634,536	44.6	14,250
Hiroshima	340,000 (pre-war)	26.5	12,750
Center of City	184,000 (1 Aug 45)	4.0	46,000
Nagasaki	250,000 (pre-war)	35.	7,000
Built-up area	220,000 (1 Aug 45)	3.4	65,000

SOURCE: New York: Fortune, July, 1939 - Other U.S. cities: 16th Census of U.S. (1940)

Most of the population densities in this table are merely averages for people within a city limits. Most meaningful, therefore, are the figures for the central areas of Hiroshima and Nagasaki, and for the boroughs of New York. The casualty rates at Hiroshima and Nagasaki, applied to the massed inhabitants of Manhattan, Brooklyn, and the Bronx, yield a grim conclusion. These casualty rates, it must never be forgotten, result from the first atomic bombs to be used and from bombs burst at considerable distances above the ground. Improved bombs, perhaps detonated more effectively, may well prove still more deadly.

B. What We Can Do About It.

The danger is real -- of that, the Survey's findings leave no doubt. Scattered through those findings, at the same time, are the clues to the measures that can be taken to cut down potential losses of lives and property. These measures must be taken or initiated now, if their cost is not to be prohibitive. But if a policy is laid down, well in advance of any crisis, it will enable timely decentralization of industrial and medical facilities, construction or blueprinting of shelters, and preparation for life-saving evacuation programs. The almost unprotected, completely surprised cities of Japan suffered maximum losses from atomic bomb attack. If we recognize in advance the possible danger and act to forestall it, we shall at worst suffer minimum casualties and disruption.

Since modern science can be marshalled for the defense as well as the attack, there is reason to hope that protective weapons and techniques will be improved. Even protective devices and vigilance, however, cannot be perfect guards against surprise or initial attack, or against the unlimited choices of targets offered an enemy through the range and speed of modern weapons. In our planning for the future, if we are realistic, we will prepare to minimize the destructiveness of such attacks, and so organize the economic and administrative life of the nation that no single or small group of successful attacks can paralyze the national organism. The foregoing description of the effectiveness of the atomic bomb has shown clearly that, despite its awesome power, it has limits of which wise planning will take prompt advantage.

B File

Shelters

The most instructive fact at Nagasaki was the survival, even when near ground zero, of the few hundred people who were properly placed in the tunnel shelters. Carefully built shelters, though unoccupied, stood up well in both cities. Without question, shelters can protect those who get to them against anything but a direct hit. Adequate warning will assure that a maximum number get to shelters.

Analysis of the protection of survivors within a few hundred feet of ground zero shows that even gamma rays can be shielded against. At Hiroshima, for example, persons in a concrete building 3600 feet from ground zero showed no clinical effects from gamma radiation, but those protected only by wooden buildings at a similar distance suffered from radiation disease. The necessary thickness varies with the substance and with the distance from the point of detonation. Adequate shelters can be built which will reduce substantially the casualties from radiation.

Men arriving at Hiroshima and Nagasaki have been constantly impressed by the shells of reinforced concrete buildings still rising above the rubble of brick and stone or the ashes of wooden buildings. In most cases gutted by fire or stripped of partitions and interior trim, these buildings have a double lesson for us. They show, first, that it is possible without excessive expense to erect buildings which will satisfactorily protect their contents at distances of about 2000 feet or more from a bomb of the types so far employed. Construction of such buildings would be similar to earthquake resistant construction, which California experience indicates would cost about 10% to 15% more than conventional construction. Even against more powerful bombs or against near misses, such construction would diminish damage. Second, the internal damage illustrates the danger from interior details and construction which result in fire or flying debris in otherwise sound buildings. The elimination of combustible interiors and the provision of full-masonry partition walls, fire-resistive stair and elevator enclosures, and fire division walls would localize fires. Avoidance of glass, tile, or lath and plaster on wood stud would cut down damage from flying debris. The studies of the Physical Damage Division of the Survey support such recommendations and include many others.

The survival of sheltered sections of Nagasaki suggests forcefully the use that can be made of irregular terrain. Uneven ground reduces the spread and uniformity of blast effect. Terrain features such as rivers and parks afford natural firebreaks and avenues of escape.

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Decentralization.

Hiroshima and Nagasaki were chosen as targets because of their concentration of activities and population. The population density of forty-five thousand or more per square mile of built-up area explains in part the high casualty rate. Significant therefore is the fact that deaths at Nagasaki, despite the greater population density, were only half those at Hiroshima: the difference can be assigned in the main to the separation of the dispersed built-up pockets at Nagasaki, in contrast to the uniform concentration of the inhabitants in the heart of Hiroshima. The Nagasaki bomb thus dissipated much of its energy against hills, water, or unoccupied areas, while the Hiroshima bomb achieved almost optimum effect.

The fate of industries in both cities again illustrates the value of decentralization. All major factories in Hiroshima were on the periphery of the city -- and escaped serious damage; at Nagasaki, plants and dockyards at the southern end of the city were merely intact, but those in the valley where the bomb exploded were seriously damaged. So spread out were the industries in both cities that no single bomb could have been significantly more effective than the two actually dropped.

Medical facilities, crowded into the heart of the city rather than evenly spread through it, were crippled or wiped out by the explosion. Only the previous removal of some stocks of medical supplies from Hiroshima to outlying communities, and the bringing in of aid, enabled the limited medical attention of the first few days.

These results underline those in conventional area raids in Germany, where frequently the heart of a city was devastated while peripheral industries continued to produce and where (particularly in Hamburg) destruction of medical facilities just at the time of greatest need hampered care of wounded.

The similar peril of American cities and the extent to which wise zoning has diminished it differ from city to city. Though a reshaping and partial dispersal of the national centers of activity are drastic and difficult measures, they represent a social and military ideal toward which very practical steps can be taken once the policy has been laid down. In the location of plants, administrative headquarters, and hospitals particularly, the value of decentralization is obvious, and can be obtained cheaply if the need is foreseen. For example, by wise selection of dispersed sites, the present hospital building program of the Veterans' Administration could be made to lessen our congestion without additional cost.

B File

Reserve stocks of critical materials and of such products as medical supplies should be kept on hand. This principle of maintaining reserves applies also to the capital equipment of the country. Key producing areas must not be served by a single source of power or channel of transportation. Indispensable materials must not come from processing plants of barely adequate capacity. Production of essential manufactured goods -- civilian and military -- must not be confined to a few or to geographically centralized plants. And the various regions of the country should be encouraged to approach balanced economic development as closely as is naturally possible. An enemy viewing our national economy must not find bottlenecks which use of the atomic bomb could choke off to throttle our productive capacity.

Civilian Defense.

Because the scale of disaster would be certain to overwhelm the locality in which it occurs, mutual assistance organized on a national level is essential. Such national organization is by no means inconsistent with decentralization; indeed, it will be aided by the existence of the maximum number of nearly self-sustaining regions whose joint support it can coordinate. In addition, highly trained mobile units skilled in and equipped for fire-fighting, rescue work, and clearance and repair should be trained for an emergency which disrupts local organization and exceeds its capability for control.

Most important, a national civilian defense organization can prepare now the plans for necessary steps in case of crisis. Two complementary programs which should be worked out in advance are those for evacuation of unnecessary inhabitants from threatened urban areas, and for rapid erection of adequate shelters for people who must remain.

Active Defense.

Protective measures can substantially reduce the degree of devastation from an atomic bomb and the rate of casualties. Yet if the possibility of atomic attack on us is accepted, we must accept also the fact that no defensive measures alone can long protect us. At best they can minimize our losses and preserve the functioning of the national community through initial or continuing partial attack. Against full and sustained attacks they would be ineffectual palliatives.

As defensive weapons, atomic bombs are useful primarily as warnings as threats of retaliation which will restrain a potential aggressor from their use as from the use of poison gas or biological warfare. The mission of active defense, as of passive defense, is thus to prevent the surprise use of the atomic bomb from being decisive. A wise military establishment will make sure -- by dispersal, concealment, protection, and constant readiness of its forces -- that no single

blow or series of blows from an enemy can cripple its ability to strike back in the same way or to repel accompanying attacks from other air, ground, or sea forces. The measures to enable this unrelaxing state of readiness are not new; only their urgency is increased. Particularly is this true of the intelligence activities on which informed decisions and timely actions depend.

The need for research is not limited to atomic energy itself, but is equally important in propellants, detection devices, and other techniques of countering and of delivering atomic weapons. Also imperative is the testing of the weapon's potentialities under varying conditions. The coming Operations Crossroads, for example, will give valuable data for defining more precisely what is already known about the atomic bomb's effectiveness when air-burst; more valuable, however, will be tests under new conditions, to provide sure information about detonations at water level or underwater, as well as underground. While prediction of effects under differing conditions of detonation may have a high degree of probability, verified knowledge is a much better basis for military planning.

Conclusion.

One further measure of safety must accompany the others. To avoid destruction, the surest way is to avoid war. This was the Survey's recommendation after viewing the rubble of German cities, and it holds equally true whether one remembers the ashes of Hiroshima or considers the vulnerability of American cities.

Our national policy has consistently had as one of its basic principles the maintenance of peace. Based on our ideals of justice and of peaceful development of our resources, this disinterested policy has been reinforced by our clear lack of anything to gain from war -- even in victory. No more forceful arguments for peace and for the international machinery of peace than the sight of the devastation of Hiroshima and Nagasaki have ever been devised. As the developer and exploiter of this ominous weapon, our nation has a responsibility, which no American should shirk, to lead in establishing and implementing the international guarantees and controls which will prevent its future use.

B F

APPENDIX

This summary report was compiled from the special studies listed below, which contain the fully documented analysis of the Survey's technical experts. Inquiries concerning these reports should be addressed to the G-2 Section, U.S. Strategic Bombing Survey.

A. Physical Damage Division Report on Hiroshima.

1. Object of Study
2. Summary
3. General Information
4. Description of Target
5. HE Attacks on Hiroshima
6. Description of the Atomic Bomb Attacks
7. Determination of Zero Points
8. Typical Japanese Dwellings
9. Fire: Cause and Extent
10. Damage to Buildings
11. Damage to Machine Tools
12. Damage to Bridges
13. Damage to Services and Utilities
14. Damage to Stacks
15. Probable Effects on Other Targets (Tentative)
16. Photo Intelligence

B. Physical Damage Division Report on Nagasaki.

1. Summary and General Information
2. Industrial Buildings
3. Public Buildings
4. Utilities
5. Machine Tools
6. Bridges and Docks
7. Fire
8. Appendices

C. Medical Division Report: "Effects of the Atomic Bombings on the Public Health at Hiroshima and Nagasaki."

D. Urban Areas Division Reports on Hiroshima and Nagasaki.

E. Civilian Defense Division Reports on Japanese Civilian Defense.

F. Morale Division Report: "Effects on Morale of the Atomic Bombings of Hiroshima and Nagasaki".

G. Chairman's Office: "Japan's Decision to Surrender".

ENCLOSURE "A"

THE EVALUATION of the ATOMIC BOMB

as a

MILITARY WEAPON

The Final Report
of the
Joint Chiefs of Staff
Evaluation Board
For
Operation Crossroads

30 June 1947

DECLASSIFIED

R. O. 11632, Sec. 3(F) and 3(D) or (E)

OSD Issue, April 12, 1974

By NLT ✓; NARS Date 10-5-74

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OCT 6 1975

Charles F. Knobell

REVIEWED BY

DATE

B F

Explanatory Note

The following pages contain the salient portions of the final report of the Joint Chiefs of Staff Evaluation Board. The Board has seen fit, in the national interest, to delete certain paragraphs. Other deletions have been made by competent authority in accordance with the provisions of the ATOMIC ENERGY ACT. The Joint Chiefs of Staff have made further deletions in the interest of security of military data derived from the Crossroads tests, (or otherwise in the national interest at the request of higher authority).*

* This clause to be added, or some suitable equivalent, in case the President wishes the bracketed paragraphs to be deleted.

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- Technical Aids to the Board

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* If "Five - Atomic Warfare Policy" is deleted, page numbers must be corrected accordingly.

Acknowledgments

In the preparation of this report the Board availed itself of the services of Rear Admiral W. S. Parsons, USN, Chairman, JOINT CROSSROADS COMMITTEE and found his advice and assistance of great value. In addition, members of the Operations Evaluation Group, Office of the Chief of Naval Operations, were of service to the Board. Its members are especially indebted to Dr. Edward S. Gilliland, Jr., Technical Director of JOINT CROSSROADS COMMITTEE; to Dr. Arthur Brown, of the OEG; and Commander Roger Rovelle, USNR, Oceanographic Assistant to the Director of Ship Material and Co-ordinator for Oceanography to the JOINT CROSSROADS COMMITTEE, for material especially prepared for this report. Rear Admiral T. A. Solberg, USN, Director of Ship Material and Capt. F. X. Forrest, USN, Bureau of Ships, were generous in their assistance. Col. Stafford L. Warren, USA (MC), Radiological Safety Advisor, OPERATION CROSSROADS, was of great assistance to the Board in his field. Credit for material taken from the reports of others is contained in the text of this report.

This report was prepared under the direction of the Board by Mr. Russ Symontowne, Expert-Consultant to the Civilian Members of the Board and Chief of its Secretariat. Mr. Symontowne had the assistance of Dr. Thornton Page, Col. Robert G. Butler, Jr., USA, and Maj. Glen W. Clerk, USA, Technical Aids and Consultants to the Military and Naval Members of the Board.

~~TOP SECRET~~

PART I -- Letter of Transmittal

The Joint Chiefs of Staff
Washington
D. C.

Subject: Final Report, JCS Evaluation Board

Gentlemen:

Your Board, appointed to evaluate the Bikini Atoll Atomic Bomb tests, has the honor to transmit to you its final report.

In accordance with our Directive this report is classified as a TOP SECRET. In order that the Joint Chiefs of Staff may make this report public, the Board has prepared a revision from which certain matter has been deleted. Prior to the publication of this revision it will be necessary that classified factual material be deleted by the Joint Chiefs of Staff.

We regret the death of Gen. Joseph W. Stilwell, an original member of the Board, who took an active part in its early deliberations. His duties have been capably discharged by Lieut. Gen. A. C. Wedemeyer, whom you appointed to succeed him.

Respectfully yours,

Lt. Gen. L. H. Brorson, USA
Bradley Dewey
Thomas F. Farrell
Vice Adm. John H. Hoover, USN

Rear Adm. Ralph A. Orstio, USN
Lt. Gen. A. C. Wedemeyer, USA
Karl T. Compton, Chairman

PART II - The Board's Participation in the Tests

1. Under date of 27 February 1946, William D. Leahy, Fleet Admiral, United States Navy, Chief of Staff to the Commander in Chief of the Army and Navy transmitted a memorandum for the Chairman, Evaluation Board, Atomic Bomb Tests with the subject: "Instructions to Evaluation Board, for the Atomic Bomb Tests".

This memorandum charged the Board with "two broad functions":

"a. To be available for advice to the Task Force Commander during the preparations for the tests.

"b. To examine and evaluate for the Joint Chiefs of Staff the results of the tests."

2. There followed instructions for the preparation of two preliminary, public reports, one to be submitted immediately upon the conclusion of each test.

3. Concerning its final report this memorandum informed the Board that it should include "pertinent comments on strategy, tactics, and technical information valuable to the national interests of the United States".

4. The memorandum further read: "The Evaluation Board will be guided exclusively by its own judgment in its evaluations based on the results of the tests. Particular attention will be paid in the final evaluation to the strategic implications of the results as well as the factual damage incurred by naval vessels and other material".

5. The Chairman, acting on behalf of the Board and with its subsequent approval, offered 2 April 1946 several suggestions to the Commander, Joint Task Force One, with respect to the oil, gasoline and ammunition loadings of certain target vessels as well as to instrumentation for the tests. The Chairman's observations, together with the reply of the Task Force Commander have been presented previously.

6. The Board held three meetings in Washington, prior to the tests, these being on 23 February, 26 March and 29 April. Its members and staff left Washington for Bikini Atoll 23 June and, after witnessing the tests, returned 1 August. Numerous meetings and consultations with the Task Force Commander, members of his staff and civilian experts were held during the tests. The Board members were afforded every facility for the performance of their duties and enjoyed every courtesy from all with whom they came in contact.

7. Following the tests, the Board held three meetings in Washington for the preparation of this report. These meetings took place 13 and 14 January 1947, 11 February and 25 April. The Board held its final meeting in Cambridge, Mass., 24 June.

PART III -- Conclusions and Recommendations

Section One - CONCLUSIONS

Note: Several paragraphs have been deleted and the paragraph numbers adjusted accordingly.

1. The Board has reached the following major conclusions:

(1) If used in numbers, atomic bombs not only can nullify any nation's military effort, but can demolish its social and economic structures and prevent their reestablishment for long periods of time. With such weapons, especially if employed in conjunction with other weapons of mass destruction as, for example, pathogenic bacteria, it is quite possible to depopulate vast areas of the earth's surface, leaving only vestigial remnants of man's material works.)

(2) The threat of the uncontrolled use of the atomic bomb and of other weapons of mass destruction is a threat to mankind and to civilization. Only the outlawing of all war and the setting up of an adequate international control of weapons of mass destruction can lift this threat from the peoples of the world.

(3) In the absence of absolute guarantees of abiding peace, the United States has no alternative but to continue the manufacture and stockpiling of weapons of nuclear fission and to carry on continuous research and development for their improvement and improvement in the means of their delivery.

(4) The value of surprise in attack has increased with every increase in the potency of weapons. With the advent of the atomic bomb, surprise has achieved supreme value so that an aggressor, striking suddenly and unexpectedly with a number of atomic bombs might, in the first assault upon his vital targets, achieve such an order of advantage as would insure the ultimate defeat of an initially stronger adversary.

(5) There must be national recognition of the probability of surprise attack and a consequential revision of our traditional attitudes toward what constitute acts of aggression so that our armed forces may plan and operate in accordance

with the realities of atomic warfare. Our policy of national defense must provide for the employment of every practical means to prevent surprise attack. Offensive measures will be the only generally effective means of defense, and the United States must be prepared to employ them before a potential enemy can inflict significant damage upon us.

(6) National defense requirements of the future are only those of the past; any aggressor must be overcome with superior force. But, where in the past, the duty of the President, as the Commander in Chief has been restricted (before formal declaration of war) to action only after the loss of American lives and treasure, it must be made his duty in the future to defend the country against imminent or incipient atomic weapon attack.

(7) What constitutes an "aggressive act" or "imminent" or "incipient" attack it is the responsibility of the Congress to define and to redefine, from time to time, so that it may draft suitable standing orders to the Commander in Chief for prompt and effective atomic bomb retaliation should another nation ready an atomic weapon attack against us.

(8) No weapon can be more effective than the means used to bring it into action against the enemy; hence the necessity for the coordinated development of atomic weapons and weapon-carriers and their integration into a series of devices, each with a tactical or strategic purpose. In the category of weapon-carrier may be included any means of ultimate delivery such as aircraft, guided missiles, rockets, torpedoes and mines of all types.

(9) Inseparable from the development of bombs and bomb-carriers, should be the planning of naval surface and submarine vessels from which atomic bomb-carriers may be launched or discharged, as well as of land launching devices, stationary or mobile, and the acquisition and maintenance of land and air bases.

(10) Any target study must include a critical consideration of the vulnerability of this country to atomic bomb attack and should lead to the study of ways and means of reducing this vulnerability, not only by physical dispositions and military measures, but by suitable training and indoctrination of military personnel and civilian population.

(11) No specific defense against the bomb exists nor, in the current opinion of science, is any likely to be devised. Such passive defense measures as concealment, or massive shielding, or below-ground construction may well serve in the case of vital military facilities, but these measures are impracticable for the defense of a city and its inhabitants.

(12) For defense against atomic weapons, chief reliance must be upon the prevention or frustration of an enemy attack, or upon immediate retaliatory measures which will overwhelm an enemy and result in the destruction of his power and ability to make war.

(13) Essential to any plan of defense will be (a) knowledge as to whether potential enemies are in possession of the means to produce weapons of nuclear fission and (b) knowledge of their readying an attack. To gain this knowledge there will be required an intelligence service with a far greater effectiveness than any such service this country has had in peace or war.

(14) A corrolation of the Bikini test data with other data, indicates that ships at sea and bodies of troops are, in general, unlikely to be regarded as primary atomic bomb targets, although in special circumstances they would undoubtedly invite such attack.

(15) The advent of the atomic bomb has not eliminated the need for ground, sea and air forces, although it may affect their composition in sizable degree. B F

(16) No result of the Bikini tests indicates the wisdom of any departure from the principle that naval ship design should be based upon tactical function. Neither did the tests B F

indicate that the design requirements of ships, as dictated by tactical function, should be compromised by emphasis upon additional protection from atomic weapons beyond that degree appropriate to the type.

(17) Dominance in the ability to wage atomic warfare, the loss of which might be fatal to our national life, can be retained only by unflagging effort to hold that leadership in science and engineering which made the atomic bomb possible. A vital part of the national defense must be not only a program of scientific and engineering research and development in every field involved in bomb production and tactical use, but in basic science as well. Such a program requires periodic tests of atomic weapons.

(18) A peace enforced through fear is a poor substitute for a peace maintained through international cooperation based upon agreement and understanding. But until such a peace is brought about, this nation can hope only that an effective deterrent to global war will be a universal fear of the atomic bomb as the ultimate horror in war.

Section Two - RECOMMENDATIONS

Note: Several recommendations have been deleted and the paragraph numbers adjusted accordingly.

1. The Board recommends:

(1) That, since the abolition of war is the only absolute protection humanity can have against possible annihilation of its civilization by atomic and other weapons of mass destruction, the Joint Chiefs of Staff continue to give every proper support to plans for the achievement of an acceptable guaranty of international peace.

(2) That so long as the world lacks such acceptable guarantees of permanent peace, the manufacture and stockpiling of atomic weapons and fissionable materials be continued by the United States in such quantities and at such a rate of production as will give to it the ability to overwhelm swiftly any potential enemy.

(3) That a constant program of research and development be carried on looking to the improvement of atomic weapons.

(4) That legislation be enacted by the Congress establishing new definitions of acts of aggression and incipient attack, including the readying of atomic weapons against us. This legislation should make it the duty of the President of the United States, as Commander in Chief of its Armed Forces, after consultation with the Cabinet, to order atomic bomb retaliation when such retaliation is necessary to prevent or frustrate an atomic weapon attack upon us.

(5) That the development of atomic weapons and weapon-carriers be so coordinated as to integrate them into a series of devices of specific tactical use and widest military effectiveness.

(6) That the conclusion be accepted that passive defense (dispersion, concealment, and above- or below-ground protection) practical for relatively small facilities is impracticable for urban and industrial areas.

(7) That studies be undertaken to determine to what extent and in what manner military and other targets of high importance can be given adequate protection.

(8) That studies be undertaken to determine measures (a) for the immediate relief of survivors of atomic bomb attacks, (b) for the reduction of mortality by medical techniques, (c) for the suitable advance training of military and civilian personnel in radiological safety techniques, including methods of decontamination, and, (d) for the development of instruments and equipment necessary to the foregoing.

(9) That, it being evident that early knowledge of a potential enemy's production of fissionable material in war quantity and of his readying of atomic weapons for use is of essential value to our defense, we maintain an intelligence service with a far greater effectiveness than any such service this country has had heretofore in peace or war.

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(10) That tests of atomic weapons be held whenever necessary in the research and development of such weapons or the tactics of their use or the training of personnel.

(11) That the Atomic Energy Commission be requested to re-classify as soon as possible Bikini test results now classified either in a military sense or under the Atomic Energy Act, so that (a) certain data will be available to military schools and (b) other data will be unrestricted.

(12) That the Congress review, in the light of new considerations and in the interests of the long-term effectiveness of the national defense, the statement of policy upon which the Atomic Energy Act is based.

PART IV -- Text of the Report

Section One--operation CROSSROADS

1. The Board finds from available figures that operation CROSSROADS, in the conduct of atomic bomb tests, ABLE and BAKER, held at Bikini Atoll, 1 July and 25 July 1946, respectively, cost the Government an extra expense approximating \$50,000,000.

2. The tests fully accomplished two major purposes:

(1) They provided data essential to future military planning, giving bases for the calculation of the conditions under which the maximum destructive effects of an atomic explosion will be obtained against various types of land and water targets and against living organisms. Some estimate of the amount of this material may be gained from the statement that the Technical Historian's summary report alone consists of 32 chapters while more than 30,000 pages of detailed technical reports have been written with others in preparation.

(2) The tests gave to those upon whom falls the responsibility of various phases of atomic warfare planning, the incalculable benefit of a first-hand knowledge of the bomb in action, an advantage theretofore possessed by very few persons.

3. The tests furnished a vast amount of data of importance in wide and varied military, scientific, engineering and technological fields. Many of these data remain classified, either in a military sense, or as restricted data under the Atomic Energy Act. Of especial peacetime value are the data relating to nuclear physics, medical phases of radiation, including military aspects of radiological safety, and those relating to oceanography, meteorology, and marine and island biology and ecology.

4. The tests had further value in again demonstrating the ability of personnel of all branches of the armed services and civilian personnel to work in efficient harmony, setting a pattern for such cooperation in the future.

5. We feel that the conclusion expressed as to Test ABLE in our Preliminary Report 5 July 1946 may now be stated as a fact as to both tests, that is, that "the conditions were well chosen and that the highest skill and ingenuity have been used to obtain a maximum amount of data in an unbiased, scientific manner". The Board feels that the tests were valid and the Summary Reports therefrom honest and competent.

6. In a supplement to our first Preliminary Report which was made a part of our Second Preliminary Report we called attention to the fact that the ABLE bomb did not burst at the planned explosion point.

7. Only four ships and craft instead of ten as planned were within relatively close range of the projected point of burst and only 16 ships and craft instead of 25 as planned were within medium range.

8. The tests focussed the attention of the world upon the atomic bomb. They were held in the presence of a large number of correspondents (Test ABLE, 175; Test BAKER, 75) representing various media of public information. Approximately 2,417,500 words (in five languages) were transmitted by radio to newspapers and magazines; 615 radio broadcasts and 401 radiophotos were transmitted.

9. Certain pertinent comments and criticisms on the functioning of the public information plan have been submitted.

10. As a result of carefully planned operating procedures and radiological safety measures, no casualties resulted from explosion or radiation during, or after, either test and casualties from other causes were remarkably few.

Section Two--GENERAL PHENOMENA

1. As the Board indicated in its preliminary reports on Tests ABLE and BAKER, the phenomena attending the explosions of both bombs, followed to a remarkable degree the predictions made by civilian and service experts.

2. Data on these phenomena are now in process of analysis and will be available to the Joint Chiefs of Staff.

3. One phenomenon of great importance, the base surge which appeared after the explosion of BAKER bomb, was not predicted.

Section Three--EFFECTS ON SHIPS

One--Damage Results

1. For the following brief summary of ship damage resulting from the bursts of Test ABLE and Test BAKER, the Board has drawn upon a large accumulation of data.

2. It is to be noted that the targetarray at Bikini did not, in either of the tests, represent any ordinary pattern of ship anchorage used by the Navy except in the case of surplus naval and merchant vessels anchored in close proximity in dead storage. Rather, the ships were arranged in accordance with the CROSSROADS directive to insure graded damage from sinking to negligible, and with the hope that a majority would remain afloat, so that data and instruments might be recovered.

TEST ABLE

3. As a result of the air burst in Test ABLE there was sunk a total of five target vessels in the array of 88 ships and small craft. They consisted of two destroyers, two transports, and the Japanese cruiser SAKAMA.

4. In addition six (non-sunk) vessels were immobilized. Those included two battleships, two cruisers, a destroyer and a light carrier. Ships' top hamper, exposed electronic equipment and instruments were damaged.

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5. Submarines, both surfaced and submerged, proved less vulnerable than other types of vessels.

6. Although most of the damage was due to blast, small fires were started on a total of 23 ships. The exact cause of these fires is not clear in every case; in general they were minor, and because no damage control measures were immediately possible, fire damage exceeded that which might have been expected had the ships been沉没ed.

7. Except for that caused by the minor fires at long range, there was little damage to some types of materials exposed on the decks of target ships.

8. There was induced radioactivity in the sodium and phosphorus contained in small stores such as soap and matches. This effect was of negligible importance and fell off rapidly within 24 hours. The lethal effects of radiation are discussed in Section Four.

TEST BAKER

9. The damage produced by the underwater burst of Test BAKER was caused largely by the underwater shock wave. Surface waves also caused heavy damage, and some damage resulted from an air blast.

10. Of the 83 ships and small craft exposed in Test BAKER, the burst sank or capsized a total of nine vessels. Five (non-sunk) vessels were immobilized. Three other vessels suffered, at least temporary, serious loss of military efficiency.

(The ship figures above include the Japanese battleship NAGATO which sank five days after the explosion, but not the German cruiser PRINZ EUGEN which sank near Kwajalein Atoll almost

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five months later. On both these ships the hazards due to radioactive contamination prevented control of slow leaks. In the case of the NAGATO, these hazards prevented inspection of damage by boarding parties.)

BOTH TESTS

11. Correlating the general effects of the two bomb bursts on ships and material, it can be stated:

(1) Little or no underwater damage was done by the air burst while severe underwater shock and wave motion accompanying the BAKER burst did heavy damage to ships' structure and equipment below the waterline.

(2) The air blast of Bomb-A caused extensive damage to superstructures, stacks and exposed decks. An air blast of lesser magnitude accompanied the detonation of BAKER bomb. Extensive damage to above-water portions of ships was caused (a) by this blast and (b) by breaking waves which engulfed ships with masses of water.

(3) Fires were set by the explosion of Bomb-A; no fires resulted from the second burst.

Two--Naval Design and Training

1. No result of the Bikini tests indicates the wisdom of a deviation from the principle that ship design should be based upon tactical function. Neither did the tests indicate that the design requirements of ships, as dictated by tactical function, should be compromised by emphasis upon additional protection from atomic weapons beyond that degree appropriate to the type.

2. The foregoing considerations should not deter study of (a) measures to minimize the bomb's explosive effects upon

structure and personnel, (b) its radiation effects upon the latter, (c) routines (organization bills) for ships' personnel, the development of instruments to determine the radiation dosage received by personnel exposed to such radiation, and the extent and degree of contamination of structures.

3. An impressive result of BAKER was the contamination of ships by fission fragments. Efforts to decontaminate these ships have thus far emphasized the difficulties of the problem and the necessity for further experiment with Bikini target vessels. Techniques developed for ships will apply to the decontamination of other structures.

Section Four--EFFECTS UPON THE HUMAN ORGANISM

1. From a military viewpoint, the atomic bomb's ability to kill human beings or to impair, through injury, their ability to make war is of paramount importance.

2. Thus the over-all result of a bomb's explosion upon the crew of a ship or the inhabitants of a city is of greater interest here than an analysis of the physiological causes of these results.

3. Instrumental data and the results of animal experimentation at Bikini sustained the reports of Nagasaki and Hiroshima observers that the effects of an atomic explosion upon living organisms may be several fold:

- (1) They may be burned by the flash heat of the bomb.
- (2) They may suffer organic impairment by external radiation at the instant of blast.
- (3) They may suffer impairment by radiation after the blast from contaminated surfaces or by the entrance into the body of fission fragments and unfissioned material.

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(4) They may be subjected to the air blast of the explosion and also to the mechanical effects of falling and flying debris and to secondary fires.

4. Since it is estimated 92 per cent of those within a radius of 660 yards from the projected ground point of the air burst at Nagasaki were killed by one or more of the bomb's effects, a discussion of separate effects within this range is academic.

5. Beyond this range, the British Mission to Japan found that the probable order of the causes of death was (1) burns, (2) mechanical injury, and (3) gamma radiation.

6. Of the utmost significance, analysis of the Japanese data reveals that, had the bomb's effects been solely radiological, the mortality would have been substantially the same.

7. The British Mission found that at a range of 1660 yards, the mortality rate was 49 per cent, while nearly a third of those present within a radius of 2000 yards were killed. Even at 2300 yards the mortality rate was 12.5 per cent and a few were killed at the extreme range of 3000 yards.

8. Flash burn, a matter of importance in the detonation of modern explosives, occurred at an extreme range of 4600 yards at Nagasaki and it is reported that 95 per cent of those surviving the Nagasaki blast and seeking medical attention suffered from burns. (Explosion of a comparable amount of T.N.T., i.e., 20,000 tons, could be expected to produce comparable flash burn results.) It was demonstrated in the Japanese bomb drops and confirmed by the Bikini tests that so brief was the duration of the thermal radiation, that shielding even of the most unsubstantial sort (sheets of paper or thin cloth) was sufficient to protect adequately against flash burn, even within short range of the detonation.

9. The menace of nuclear radiation is present at the instant of explosion and residual radioactivity may persist for a considerable length of time thereafter in the immediate vicinity and at greater distance for diminished lengths of time.

10. Within one second of the explosion of a bomb in air, gamma radiation and neutron emission, it has been estimated, are sufficient to destroy human life at distances exceeding 1000 yards, and casualties may result at 2000 yards.

11. In the case of a burst at the land surface or at very low altitude, there is a deposition of fission products over an area of several hundred yards' radius, sufficient to be dangerous for several years; Neutron emission at the instant of burst results in induced radioactivity in various elements, notably sodium. This hazard, while it may be great for a brief period, is secondary in importance to radioactivity from other sources.

12. When a bomb is exploded underwater, lethal residual radioactivity assumes an importance greater than the physical damage caused by the explosion. Vast quantities of water falling from the explosion column and traveling outward in the base surge and, also falling as "rain" from the cauliflower cloud, carry, not only highly radioactive fission products, but unfissioned material as well.

13. Massive shielding is the only known protection against external nuclear radiation. No treatment to nullify the effects of radiation upon living organisms exists, nor is there reason to hope that means of prophylaxis (immunization or the like) can be found. (So-called "supportive measures" may be effective in prolonging life in certain "border line" cases and, it has been suggested, would reduce mortality in exposures of less than 400 roentgens.)

14. This report recognizes the importance of, but does not discuss the mechanical effects of, atomic explosion upon human beings. These effects of the atomic bomb are those common to the explosion of conventional bombs except that in the former case deaths appear to occur at lower peak pressures, perhaps because of the character of the pressure wave.

Section Five--THE USE OF THE BOMB IN WAR.

One--General Defense Considerations

1. The tremendous destructive (explosive) power of the atomic bomb and the great range of its lethal (radiation and residual radioactivity) effects, combined with the fact that no specific means of defense or of prophylaxis against it exists, or is likely to be devised, make it a weapon capable of decisive importance in war.

2. It is apparent that potential enemies of the United States will seek to arm themselves with this weapon and the means to deliver it. The speed with which they will possess atomic weapons will be conditioned largely by their scientific, technological and industrial ability to solve the problems involved. It is common knowledge that research in nuclear fission is in progress throughout the world.

3. Therefore, unless there is permanent peace - guaranteeing national security through international control of all means of war - immediate and continuous preparation for the contingencies of atomic warfare is the part of prudence.

4. In the absence of special means of defense against atomic weapons, there are the considerations (a) of conventional passive defense (interception of attacking forces and the dispersion, concealment or massive protection of targets) and (b) of the positive defense of attack.

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5. Conventional defense measures cannot be neglected, but there are severe limitations to their effectiveness. A fighter air force in being, radar networks, ample antiaircraft weapons and proximity-fused missiles, might well prove of high value in event of an attack preceded by sufficient warning. However, the great expense of this country and the vast number of targets it presents make its adequate defense by such means impracticable.

6. The passive defense of dispersion, concealment, and massive or underground protection is feasible for relatively small facilities of high military value, but could not be employed for extensive installations or cities.

7. An adequate program of defense, therefore, must have as a goal, the possession of a superior striking power and the ability to explode at will, with greatest effectiveness, such a number of suitable designed atomic weapons as will:

a. Deter a potential enemy from attack, or,

b. If he prepares an attack, overwhelm him and destroy his will and ability to make war before he can inflict significant damage upon us.

8. The effective military use of atomic weapons is conditioned by the possession:

a. Of atomic weapons in adequate numbers

b. Of suitable means for their delivery

c. Of plans for their strategic use

d. Of bases within range of enemy targets.

Two--Research, Development and Stockpiling

1. No weapon can be more effective in war than the means used to bring it into action against the enemy. Thus, it follows that emphasis should be placed upon the coordinated development of atomic weapons and weapon-carriers and their integration into a series of devices each with a tactical or strategic purpose.

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* Substitute "attacks" for "prepares an attack" and include this paragraph if its present form is disapproved.

2. Progress reports of agencies engaged in the research of guided missiles and aircraft for travel at trans-and supersonic speeds indicate that in the foreseeable future, chief reliance for aerial bomb delivery at ranges greater than 400 miles must be upon conventional aircraft. Hence, national security will require unremitting effort to develop present types of aircraft capable of operating at great range, under all weather conditions and in spite of enemy opposition.

3. Inseparable from the development of the bomb and bomb-carriers is the development of methods of bomb launching from naval vessels, both surface borne and underwater, and the acquisition of land air bases which will best insure bomb delivery to targets distant from continental United States.

4. The only means of insuring that we may be in possession of a sufficient number of bombs to overwhelm an enemy intent upon attacking us is the stockpiling of bombs and fissionable materials.

5. In the present state of science, the processing of these materials is complicated and time-consuming. It is the lesson of history that new inventions may at any time vastly accelerate presently known methods and thus make it possible for a potential enemy of the United States, starting late, to outstrip us quickly in atomic weapon production.

6. The United States cannot retain dominance in atomic warfare - the loss of which might be fatal to our national life - unless by unflagging effort it retains the leadership in nuclear physics, chemistry and engineering, which made the bomb possible. Hence, a vital part of our national defense must be a program of research and development in every field involved in bomb production.

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7. No development of any weapon or skill in its use can be achieved without periodic tests. The phenomenon of nuclear fission precludes the explosion of an atomic weapon of less than critical mass, and hence all tests must be "full scale".

Three--Measures of Active Defense

1. For so long as the United States retains exclusive possession of atomic weapons, it will be a matter of our choice, based upon political and military considerations of the moment, whether they should be employed in the event any country has the temerity to attack us.

2. Situations can be envisaged in which an aggressor, with or without the atomic weapon, relying upon various factors of war favorable to him and, making difficult our successful delivery of atomic bombs to targets vital to his military effort, might undertake an attack upon us.

3. An enemy, geographically remote, in possession of only a few atomic bombs, might contrive to deliver them in merchant vessels to our chief seaports and, without declaration of war, to discharge them in our bays and harbors and so cripple us as to permit him to proceed with an act of aggression against a third power whose integrity we desired unimpaired.

4. The advent of the atomic bomb has not eliminated our need for ground, naval and air forces. Nor has it lessened the need for overseas bases from which they can operate effectively. The relationship of the atomic weapon to other weapons and means of war in the nation's defensive armament, should be the subject of constant scrutiny in the light of changing conditions and new knowledge.

5. The length of time before potential enemies will arm themselves with weapons of nuclear fission has been variously estimated by experts, many of whom have expressed little faith in the accuracy of their predictions, but who are virtually unanimous in the belief that the development of those weapons by others is inevitable.

6. To deliver an immediately paralyzing blow, an aggressor striking against a country armed with atomic weapons, will have to rely upon the highest order of surprise and striking power. He must overwhelm his adversary with such suddenness that retaliation cannot be undertaken or, if attempted, will be unsuccessful. There will be little solace in ultimate victory if retaliation has brought national ruin to the victor. Thus, in such warfare, the element of surprise will be an essential, the possession of which will be the only assurance of success and whose lack may be catastrophic.

7. Offense, recognized in the past as the best means of defense, in atomic warfare will be the only general means of defense. Even a nation capable of retaining the will and ability to fight a victorious war after losses far greater than those of the Pearl Harbor surprise attack, can be seriously crippled, perhaps defeated, by a well planned and executed atomic bomb surprise attack. This may hold true no matter how great the damage inflicted by belated counter-attack.

8. Basic to a defense against weapons of nuclear fission will be, first, protection against surprise and, second, the ability to attack with overwhelming force before an enemy can strike a significant blow.

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Four--Intelligence

1. Protection against the catastrophic consequences of an atomic bomb surprise attack will require an intelligence service with a far greater effectiveness than any such agency that this country has ever had in peace or war. Such an agency, charged with the duty of constant, world-wide scrutiny to determine whether atomic weapons (or other weapons of mass destruction) are being manufactured or readied for use, must be the first bulwark of our national defense.
2. An effective intelligence agency must have the duty of (a) supplying early intelligence of the manufacture, by any nation, of fissionable material in war quantity, and (b) providing prompt warning should a potential enemy ready atomic weapons for use.

3. An effective intelligence service will require a coordination of the effort of existing agencies, as well as the employment of suitably trained physicists, chemists and other scientists.

Five--Atomic Warfare Policy

1. Traditionally, the policy of the United States is one of non-aggression and, as a result, in the past we have awaited attack before employing military force. Because such forbearance in the future will court catastrophe, if not national annihilation, it is necessary that, while adhering in the future to our historic policy of non-aggression, we revise past definitions of what constitutes aggression calling for military action.

2. Article 1, Section 8, paragraph 11 of the Constitution of the United States gives to the Congress the sole power to make war, and neither restricts this power nor offers instruction in its use. So long as the people of the United States adhere

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[redacted]
to the democratic form of government, this power must reside in
the Congress and can never be delegated.

[redacted]
3. Article II, Section 2, Paragraph 1 of the Constitution
declares that the "President shall be Commander-in-Chief of the
Army and Navy of the United States".

[redacted]
4. Under these ample provisions the United States has successfully defended itself in the past and we can find no reason to believe that the emergence of the atomic bomb requires any alteration of the organic law for our future defense. The security demands of the future are those of the past; any aggressor must be overcome with superior force.

[redacted]
5. Presently the duty of the Commander-in-Chief (before a declaration of war by the Congress) is confined to action only after the loss of American lives or treasure. In the future it must be made his duty to defend the country against incipient attack by atomic weapons whenever another nation is readying an atomic attack upon us.

[redacted]
6. What constitutes incipient attack it is the responsibility of the Congress to explore and define so that it may draft suitable orders to the Commander-in-Chief for the prompt and effective utilization of our armed forces should we be under the menace of an atomic weapon attack.

[redacted]
7. The processing and stockpiling of fissionable material in a certain quantity by a certain nation at a certain time may not constitute an aggressive act (incipient attack) while the same acts by another nation at another time may, upon their discovery, call for swift action in the national defense.

8. Therefore, necessarily, the Congress must, from time to time, reconsider its definitions of aggressive act and incipient attack so that it may alter and change its standing orders to the Commander-in-Chief as to the state of facts upon which it becomes his duty to defend the United States against attack by atomic weapons.

9. It will be the duty and the responsibility of the Congress to decide whether those definitions and its directions to the Commander-in-Chief be published to the world or be held secret.

10. Article II, Section 2, Paragraph 1 of the Constitution of the United States provides that the President (Commander-in-Chief) "may require the opinion in writing of the principal officer in each of the executive departments upon any subject relating to the duties of their respective offices. . . ."

11. Whatever may be the legal effect (or mandatory force) of the foregoing provision, it would seem clear that American tradition would require the Commander-in-Chief to receive the advice of Cabinet members before deciding that a dictate of the Congress requiring military action had come into force.

Six--Consideration of Targets

1. The selection of targets for attack by atomic weapons must take account of the number of such weapons available in the predictable future. Thus selection and priority of targets become of prime importance in the employment of the weapon.

2. The correlation of the results of the explosions of atomic bombs over Japanese cities and against naval vessels, at Bikini, gives ample evidence that the bomb is pre-eminently a weapon for use against human life and activities in large urban and industrial areas, as well as seaports.

3. Against structures, ashore or afloat, from a military standpoint, the blast effects of the bomb are those of a conventional explosive except for their greater magnitude. Thus, against structures, the bomb has two advantages over other explosives:
(a) it can accomplish damage over a much greater area, and
(b) the demands for accuracy in delivery of a single bomb to produce a given result are far less than for bombs loaded with conventional explosives.

4. The atomic bomb will therefore have value in the demolition of structures whenever military judgment dictates that the importance of such demolition warrants its use despite the risks and difficulties involved. Here the importance of the target combines with the value of the bomb to emphasize the importance of means of certain delivery.

5. Dams, ship canals, naval bases, immobilized naval and merchant fleets concentrated in storage areas, air fields, troops engaged in amphibious landings or concentrated in staging areas, may be cited as targets justifying the use of the atomic bomb should special circumstances give them sufficient value.

6. It would appear axiomatic that whenever a target comparable to the foregoing has such high value as to invite atomic bomb attack, it will be strongly defended. Where dispersion, concealment and massive shielding are impracticable, then air defenses may be calculated to increase greatly the risk of the delivery of the bomb to such targets by conventional aircraft.

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7. In the case of naval vessels, the Bikini tests would strongly suggest that ships under way will rarely constitute suitable targets for atomic bomb attack. Ships engaged in amphibious operations, or carriers, or groups of carriers, able to launch atomic weapons, and ships at anchorage and in harbors, will constitute exceptions.

8. For the defense, in particular cases, of Navy, Army and Air Force land facilities, as well as other installations (dams, canals, atomic bomb dumps, industrial plants) reliance must be placed in air defense measures and in dispersion, concealment, massive shielding or underground construction.

9. An air defense which would make the delivery cost of bombs prohibitive would certainly be an effective defense, as would the protection of a key facility deep underground. An intensive and energetic study would reveal the value and practicality of passive defense for specific targets.

Seven--Effectiveness of the Bomb against Cities

1. However feasible passive means of defense may prove for small vital installations, such protection will be inadequate for a city. Its structures and inhabitants, except as interception measures at a distance are effective, are fully vulnerable to atomic bomb attack.

2. Conventional methods of fire control, emergency policing, care of the wounded and the restoration of essential services would certainly mitigate the results no matter how extensive. But the personnel for these services would have to be recruited from outside the area and where radioactive contamination existed could enter it only with extreme difficulty and after some lapse of time.

3. TEST BAIER gave evidence that the detonation of a bomb in a body of water contiguous to a city would vastly enhance its radiation effects by the creation of a base surge whose mist, contaminated with fission products, and dispersed by wind over great areas, would have not only an immediately lethal effect, but would establish a long term hazard through the contamination of structures by the deposition of radioactive particles.

4. We can form no adequate mental picture of the multiple disaster which would befall a modern city, blasted by one or more atomic bombs and enveloped by radioactive mists. Of the survivors in contaminated areas, some would be doomed to die of radiation sickness in hours, some in days, and others in years. But, these areas, irregular in size and shape, as wind and topography might form them, would have no visible boundaries. No survivor could be certain he was not among the doomed and so, added to every terror of the moment, thousands would be stricken with a fear of death and the uncertainty of the time of its arrival.

5. Rescue parties could not enter any part of the city, except at the hazard of life, until the contaminated areas had been established and delimited. When this had been done, relief might be brought to those remaining in lightly contaminated areas, but the dead would remain unburied and the wounded uncared for in the areas of heaviest contamination where certain death would lurk for many days and, in which, for many years to come, continuous habitation would be unsafe.

6. Thousands, perhaps millions, of refugees would rush from the city in panic, breaking down remaining transportation facilities, congesting highways, and creating in their flight new hazards to life. Among these fugitives, for the moment undetectable from the rest, would be numbers whose contaminated

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clothing and any goods they carried could establish in others the fear of dangerous radioactivity, thus creating a unique psychological hazard.

7. It cannot be assumed that in a future war, a participant, with a range of choice, will rely altogether upon a single weapon of mass destruction. Driven by the necessity of overwhelming his adversary, lest he himself be overwhelmed, a combatant might well choose to compound the horror of an atomic bomb attack with the simultaneous delivery of pathogenic agents which would insure that frightened fugitives would spread, not only their panic, but epidemic disease as well.

Eight--Psychological Atomic Warfare

1. In the foregoing division, an attempt has been made to extrapolate from available data a statement of the gross dislocations of urban life which may be expected to result from the explosion of atomic bombs against heavily populated areas. But largely absent from this statement are speculations as to the specific psychological phenomena which such a burst will induce, and which must constitute an element of paramount importance in the selection of atomic bomb targets.

2. In the body of knowledge of human behavior, there are no data directly useful to a discussion of these phenomena as they might occur in a modern Occidental city because there have been no observations of conduct under conditions fully approximating those described above.

3. A study of the population behavior in Nagasaki and Hiroshima (Manhattan Engineer District and U.S. Strategic Bombing Survey Reports) offers little help to an understanding of what may be expected in the future, in the cases either of air or underwater bursts. Prior knowledge of the bomb's effects was not possessed

by inhabitants of the Japanese cities and made no contribution to their behavior patterns. Similarly, the inhabitants of Japan, as a whole, even after the fact, had little or no knowledge of nuclear phenomena and hence, no opportunity to exhibit anticipatory panic. Then, too, the mental makeup peculiar to the Japanese is probably at greater variance with that of Occidental peoples than the mental makeup of these peoples is, one from another. This would, of course, complicate evaluation.

4. On each of the two occasions the atomic weapon was employed in Japan, a single bomb only was burst in air over a single city on a single mission, providing no picture of the national situation which might have resulted had tens or hundreds of bombs been discharged, within a brief period of time, over several cities.

5. Moreover, there are lacking from an air burst many of the important psychic stimuli which would be present after an underwater explosion.

6. In the face of these negative findings, and of the bomb's demonstrated power to deliver death to tens of thousands, of primary military concern will be the bomb's potentiality to break the will of nations and of peoples by the stimulation of man's primordial fears, those of the unknown, the invisible, the mysterious. We may deduce from a wide variety of established facts that the effective exploitation of the bomb's psychological implications will take precedence over the application of its destructive and lethal effects in deciding the issue of war.

7. A thorough study of the many-faceted psychological problem will doubtless reveal a wide variation in the psychological military value of cities as targets.

8. There are countries where because communication facilities are so limited, large areas might be depopulated with little or no effect upon the morale of the country at large. There are cities of especial sentimental significance whose loss to a country might have a more profound effect upon the national will than the destruction of areas more important intrinsically.

9. There are cities symbolic of national greatness beyond their conventional military importance. There are capital cities vital to the national unity necessary to the prosecution of war; the loss of other capitals might scarcely distract their nation's military tempo.

10. Of as wide variation and of equal importance it will probably be found, are national temperaments, ways of life and levels of education: Paradoxically, it would seem that, within some limits, the greater the knowledge of nuclear fission phenomena, the greater the fear it engenders. Dwellers of a city who are aware of the nature of the calamities being afflicted upon their fellow countrymen of another city, will identify themselves with these calamities and may, the more easily, translate early fear into ultimate alarm and panic. Less likely are persons largely ignorant of the manifold deadliness of an atomic bomb to make these psychological adjustments.

11. With the question of a given group's reaction to the discharge of an atomic bomb (as compared to the reactions of other groups) is raised the consideration of propaganda as a means of enhancing the bomb's military utility. Coupled with this are considerations of the communication facilities of a given country and of the extent of the free exchange of information.

12. Even a cursory examination of the characteristics of the American people and of the cultural and material fabric of their national life invites the conclusion that this nation is much more

vulnerable to the psychological effects of the bomb than certain other nations. A study of the factors involved should not only assist us in determining the vulnerabilities of other nations, but, also, should lead to the development of measures to lessen the effects of these phenomena should we be attacked.

Nine--Continuous Review of Targets

1. The selection of atomic bomb targets will be seen to involve problems far more numerous and complex than those involved in the selection of targets for conventional weapons. To be fully effective, the survey of potential targets will have to be continuous so that the relative importance, as well as the accessibility, of a given target may be known at all times.
2. Exactly as the atomic weapon and weapon-carrier must be regarded as an integrated weapon and the development of each coordinated with the development of the other, so the consideration of suitable targets is inseparable from consideration of the combined potential of weapon and weapon-carrier to give a desired result.

Ten--Concluding Observations

1. The effort to appreciate the implications of atomic energy is taxing the apperceptive powers of the most unfettered minds in every field of thought. Its use, as an implement of war, poses a wider variety of new and complex problems than have ever before confronted military planners. Not merely the overcoming of the inertia of conservatism is here required, but a revolutionary change in military mental attitudes.
2. It is not always the nation first introducing a new weapon which develops its highest utility. England invented the tank, but Germany developed the tactics which made it a major weapon. Germany first employed lethal gas in battle, but her failure to

develop quickly a suitable technique of use may have cost her victory in the first World War. The possible penalty of a failure to retain dominance in the development of the atomic bomb and of the strategy and tactics of its use is so great that it must serve as a constant incentive to the best thought and effort of our military planners.

3. In conclusion the Board reverts to the ATOMIC ENERGY ACT and its basic provisions. In our opinion, these basic provisions, however justified at the moment of the ACT's passage, should be reviewed from time to time in the light of changing events.

4. The Board offers no criticism of the ATOMIC ENERGY COMMISSION. In a friendly and cooperative spirit and with long-term effectiveness of the national defense in mind, the Board recommends a reconsideration by proper authorities of the questions: Whether the Services should (a) have representation on the ATOMIC ENERGY COMMISSION, (b) own, have title to, and be charged with the control of atomic weapons after fabrication, (c) participate in the work of the design and testing of atomic weapons, and (d) control all information relating entirely to the military utilization of the weapons, as distinguished from design and development information.

